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STUDIES ON STREPTOMYCIN IN RELATION TO ITS POSSIBLE USES IN VETERINARY PRACTICE

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Since Schatz, Bugie and Waksman's (1944) original description of streptomycin, an antibiotic obtained from *Streptomyces griseus*, a voluminous literature has accumulated on its pharmacological properties in laboratory animals and man, and the clinical results obtained in a wide variety of infections.

Owing to the shortage of supplies of streptomycin in this country, clinical trials have been limited principally to studying its effects in certain types of human tuberculosis under controlled conditions. In the U.S.A. streptomycin is widely used in human practice and there are a few accounts of its employment in veterinary treatment.

It is not proposed to review all the literature, but attention will be drawn to articles considered relevant to the objectives of the work described below. Broadly speaking, before an antibiotic is employed in clinical practice, it must be of low toxicity and the following information should be available, (1) its range of activity against different bacteria *in vitro*, (2) the dosage rates required to achieve bacteriostatic or bactericidal levels in the body fluids and the persistence of such levels, the best routes of administration and the method of excretion. This article is divided into two on the above basis, section (1) being limited to organisms of common veterinary importance and section (2) to a description of results obtained in bovines.

I.—THE *IN VITRO* EFFECT OF STREPTOMYCIN ON BACTERIA OF VETERINARY IMPORTANCE

INTRODUCTION:

A number of reports have been published which deal with the range of antibiotic activity of streptomycin against widely differing species of bacteria. The majority of these articles have been confined to the behaviour of a particular group of bacteria but in many instances in which different workers have examined similar species the results obtained have differed considerably. Thus Foley and Rubenstein (1947) have reported that Salmonella cultures are sensitive to streptomycin within a range of 0·004 to 0·064 units per ml. whilst Seligmann and Wassermann (1947) have indicated that the range of activity is from 4 to 8 units per ml. Santivanez (1946) on the other hand, refers to 12·5 units per ml. as the inhibitory concentration for the same group of organisms. Results reported for cultures of Brucella are in closer agreement. Hall and Spink (1947) represent the antibiotic concentration for this species to be within 0·5 to 3 units per ml., a result which has been confirmed by Sutcliff and Mason (1947). Woodbine (1947) has described the sensitivity of *Erysipelothrix rhusiopathiae* as being within the range 3·7 to 15·5 units per ml. Gezon and Cryst (1948) have shown that streptococci belonging to Lancefield's groups A, B and C are susceptible only to relatively high concentrations of the drug, within the range 10 to 400 units per ml.

Comprehensive reports on the activity of streptomycin against a selection of different species have been made by Bugs *et al.* (1946), Price *et al.* (1947) and Coles (1948). Once again the bacteriostatic concentrations reported are variable both for individual species in the hands of different workers and individual strains within a species investigated by a single worker. Much of the variation in results will be due to the different techniques employed. The pitfalls associated with such estimations are numerous as the activity of streptomycin is influenced to a considerable degree by the composition of the medium in which the bacteria are grown and the physical conditions under which the sensitivity tests are carried out.

Publications dealing with these effects have been made by Hobby and Lenert (1947), Berkman, Henry and Riley (1947), Green and Waksman (1948) and Garrod (1948). Owing to the widely differing nutritional requirements of bacteria in general, the determination of streptomycin sensitivity and the expression of the results in terms of "micrograms or units per ml. required to inhibit growth" exhibits fallacies. A given organism will be inhibited by a certain concentration of streptomycin only in a given medium under certain physical conditions. If the medium concerned will not support the growth of all organisms tested, the introduction of other media will create a change of conditions and it will no longer be possible to compare the results between different species of organisms.

In an effort to express results in a standard manner, the present work has aimed at presenting results in terms of the relative resistance of an organism, as compared with that of a standard organism tested under identical conditions. Individual differences in the chemical and physical composition of the media are thus assumed to affect the activity of streptomycin equally against all organisms.

METHODS

The culture medium used throughout as a basis for the tests was that used by May, Voureka and Fleming (1948). The presence of phenol red and glucose provided an indicator whereby growth could be readily seen and the only modification required in their medium was the introduction of 1 per cent. peptone for the benefit of the more fastidious bacteria. Stock cultures of all organisms were grown at 37° C. in ordinary broth or serum broth for 24 hours and then standardised by opacity to a concentration of 300,000,000 organisms per ml. Dilution of the culture was then carried out in the basic culture medium to a concentration of 10^{-6} and this was added to the appropriate dilutions of streptomycin sulphate. This salt was used throughout these experiments. It was prepared in solution in distilled water and sterilised by filtration. This solution was then diluted in the basic culture medium to a concentration of 20 units per ml. and all further dilutions were prepared from this stock which was freshly made each day.

The test for each culture consisted in adding to each of a series of tubes 0·5 ml. of falling dilutions of streptomycin sulphate from 20 units per ml. downwards. (This range was extended upwards for the more resistant species.) To each of these tubes was added

an equal volume of the culture diluted as described above. Two more tubes were included, one to test the sterility of the streptomycin solution and the other to verify the growth of the culture under test in the absence of streptomycin. The organism used throughout was Friedlander's Bacillus (*Klebsiella pneumoniae*) 41 (N.C.T.C.) and a subculture of this organism was included in each batch of tests under identical conditions to those obtaining for the cultures under investigation. All results were thus expressed in terms of resistance as compared with this organism and the so-called coefficient of resistance was obtained from the expression:

$$\text{Coefficient of resistance of organism tested.} = \frac{\text{Units per ml. of streptomycin sulphate required to inhibit organism under test.}}{\text{Units per ml. of streptomycin sulphate required to inhibit } \textit{Klebsiella pneumoniae}.}$$

All tests were incubated at 37° C. for 24 hours and readings recorded in terms of growth as shown by change of colour of the indicator from red to yellow. End points generally were clear cut and there was little doubt due to gradation of colour change or scanty growth.

Results:

The results are shown in Tables I, II and III. Table I shows the relative resistance of a number of different species to streptomycin and Tables II and III give the results for individual members within the groups of streptococci and salmonella.

Table I

Resistance of Certain Organisms to Streptomycin

	Total No. of strains tested	Resistance of individual strains — Coefficient of resistance									Average coefficient of resistance
		128	64	32	16	8	4	2	1	0·5	
Streptococci	28	15	5	6	2	—	—	—	—	—	88
Salmonella	26	—	—	1	7	13	3	2	—	—	10·1
Ery. rhusiopathiae	7	—	—	—	2	4	1	—	—	—	9·7
Ery. monocytogenes	7	—	—	—	1	—	—	1	4	1	3·2
C. renale	7	—	—	—	—	1	1	5	—	—	3·1
Past. septica	5	—	—	—	—	—	2	1	1	1	2·3
Bact. coli	13	—	—	—	—	—	2	7	3	1	1·96
Staphylococcus pyogenes	9	—	—	—	—	—	—	3	3	3	1·16
C. pyogenes	6	—	—	—	—	—	—	—	5	1	0·92

Table II

Resistance of Certain Groups of Streptococci to Streptomycin

Group	Total No. of strains tested	Resistance of individual strains — Coefficient of resistance			
		128	64	32	16
F. (Lancefield)	3	2	1	—	—
D. (Lancefield)	4	3	—	1	—
B. (Lancefield) (*Strep. agalactiae*)	11	6	2	3	—
Strep. dysgalactiae (Minett, Group II)	5	2	1	1	1
C. (Lancefield)	2	2	—	—	—
G. (Lancefield)	3	—	1	1	1

Table III

Resistance of Certain Types of Salmonella to Streptomycin

Type	Total No. of strains tested	Resistance of individual strains — Coefficient of resistance				
		32	16	8	4	2
Salm. cholerae suis	2	1	—	—	1	—
Salm. typhimurium	6	—	3	3	—	—
Salm. thompson	4	—	2	—	1	1
Salm. dublin	6	—	1	5	—	—
Salm. pullorum	4	—	—	4	—	—
Salm. gallinarum	4	—	1	1	1	1

The results reported by other workers are more usually expressed in terms of units per ml. required to inhibit growth, so that direct comparison of the present results with those previously published is difficult. As a general rule, however, the unitage of streptomycin required to inhibit the growth of Friedlander's Bacillus varied only within narrow limits around 0·078 units per ml. and if this figure be taken as a basis for comparison the results for other organisms may be expressed by multiplying this figure by the coefficient of resistance for the particular organism. The results obtained by this method are shown in Table IV.

Table IV

Relative Concentration of Streptomycin Inhibiting Growth of all Organisms Tested

Organism	Total No. of strains tested	Units per mil. required to inhibit									Average units per mil. for all strains
		10	5	2·5	1·25	0·62	0·31	0·15	0·078	0·039	
Streptococci	28	15	5	6	2	—	—	—	—	—	6·87
Salmonella	26	—	—	1	7	13	3	2	—	—	0·79
Ery. rhusiopathiae	7	—	—	—	2	4	1	—	—	—	0·75
Ery. monocytogenes	7	—	—	—	1	—	—	1	4	1	0·27
C. renale	7	—	—	—	—	1	1	5	—	—	0·24
Past. septica	5	—	—	—	—	—	2	1	1	1	0·177
Bact. coli	13	—	—	—	—	—	2	7	3	1	0·153
Staphylococcus pyogenes	9	—	—	—	—	—	—	3	3	3	0·0905
C. pyogenes	6	—	—	—	—	—	—	—	5	1	0·071

DISCUSSION:

Despite the limitations of the technique employed, results obtained indicate broadly the relative sensitivity of various bacteria to streptomycin. The results for each species fall within well defined limits and this fact in itself would appear to indicate that the method used has some degree of accuracy.

The high resistance of the streptococci stands out very clearly and this result agrees substantially with those of Price *et al.* (1947) and Gezon and Cryst (1948). Furthermore, the relative difference in degree of resistance between the various species tested agrees closely with the results of Price and his co-workers who gave an order similar to that shown in Table I. Coles (1948) was able to demonstrate inhibitory concentrations for a wide range of organisms of animal origin by stroking cultures on a series of agar plates containing varying concentrations of streptomycin. Many of the bacteria tested by him were not included in the present series but the order of resistance reported by Coles is again closely similar to the results reported here although in his series and ours the number of strains examined was relatively small. It is also worthy of note that Santivanez (1946) described salmonella cultures generally as being more resistant than pasteurella, which approximates to the situation in Table I.

A certain amount of variation was noted in the degree of resistance exhibited by individual strains within each species, and in the group of cultures of *Erysipelothrix monocytogenes* one strain showed a high degree of resistance as compared with the others. This gradation of sensitivity within species and also within individual cultures has been a feature of much of the work reported in the literature, but reference to Tables II and III shows that such differences encountered in the present work were all within well-defined limits.

II.—THE ABSORPTION, DURATION AND EXCRETION OF STREPTOMYCIN IN BOVINES

Among other numerous contributors to the subject, Zintel *et al.* (1945) and Adcock and Hettig (1946) have shown that streptomycin in man persists in the blood serum for longer than penicillin and the blood serum level is roughly proportional to the dose. After parenteral injection it can be detected in most body fluids although it does not pass the blood brain barrier in appreciable amounts unless there is inflammation of the meninges. Oral administration results in a high concentration in the alimentary tract but little is absorbed into the circulation. After parenteral injection approximately 65 per cent. of the injected streptomycin is excreted in the urine.

Our results are essentially a confirmation of certain of these findings as related to the bovine.

METHODS

Dosage.—Throughout these studies a standard dose of 10,000 units per kilogram bodyweight was used. This dosage was selected after studying the results obtained in man and laboratory animals by Kornegay, Forgacs and Henley (1946). The required amount of streptomycin was dissolved in distilled water and sterilised by filtration through a Seitz E.K. filter mat.

Animals.—The calves used in these experiments were Shorthorns, Ayrshires and Ayrshire-Shorthorn crossbreds aged from one to 20 weeks. Equal numbers of each sex were treated. The cows were lactating, non-pedigree Shorthorns and Ayrshires.

Estimation of Streptomycin:

1. Blood Serum: After allowing the blood sample to clot the sample was centrifuged and the supernatant serum was filtered through a Seitz E.K. filter pad. Pre-injection samples were always included. Latterly, all sera were heated at 55° C. for 30 minutes before testing, as certain sera have low levels of antibodies to Friedlander's Bacillus. In the early experiments when sera were not heated these antibodies are not considered to have influenced the streptomycin levels to any appreciable extent.

2. Urine: Urine was centrifuged and the supernatant fluid filtered through a Seitz E.K. filter pad.

3. Faeces: Four grammes of faeces were thoroughly mixed with 12 ml. of distilled water and then centrifuged. The supernatant fluid was filtered through a Seitz E.K. filter pad, the filtrate being a 1 in 4 dilution of the original faecal sample.

4. Milk: Nine ml. of a composite milk sample were mixed with 1 ml. of rennet. The mixture was heated at 55° C. for 30 minutes and then centrifuged. The supernatant fluid constituted the sample to be tested

Method of Assay.—The method used was a modification of that recommended by May, Voureka and Fleming (1948). The basic culture medium contained serum water with 1 per cent. glucose and phenol red as an indicator. Each test consisted of a series of 12 tubes, eleven of which contained 0·5 ml. of this medium, the first tube of each series being empty. Into each of the first and second tubes was placed 0·5 ml. of the sample and doubling dilutions were made in the series starting from the second tube, and being completed at the tenth. The eleventh tube was used as a control for sterility of the sample and the 12th tube as a culture control. The standard organism used was Friedlander's Bacillus which was grown in ordinary broth for 18 hours and then diluted 10^{-6} in the basic culture medium. Half a ml. of this culture was added to the first ten tubes of each set and the culture control. In the case of urine the levels were generally high and triple dilutions were made so that the series was from neat (1 in 2) to 1 in 39,366. All tests were incubated for 18 to 24 hours and readings

TABLE V

AMOUNT OF STREPTOMYCIN IN UNITS PER ML. IN THE BLOOD SERUM OF CALVES AFTER THE INTRAVENOUS ADMINISTRATION OF 10,000 UNITS STREPTOMYCIN PER KILOGRAM BODYWEIGHT

Calf Ref. No.	Bodyweight in lbs.	Dose in units	Hours after injection						
			¼	½	1	2	4–5	6–7	24
Q 1/71	170	800,000	2·50	40·0	5·00	20·00	5·00	0·62	0·3
Q 1/76A	112	500,000	40·00	20·0	10·00	0·62	0·16	1·25	0·0
Q 1/76B	104	470,000	20·00	1·25	0·31	0·16	1·25	0·16	0·0
Q 1/79	104	475,000	0·00	10·00	0·31	2·50	2·50	0·62	0·0
Q 1/89	120	550,000	2·50	5·00	1·25	0·16	0·31	0·31	0·16
Q 2/23	182	820,000	10·00	5·00	5·00	1·25	0·62	0·31	0·16
Q 2/28	188	854,000	20·00	20·00	10·00	5·00	1·25	0·62	0·31
Q 2/38	236	1,070,000	20·00	20·00	10·00	2·50	1·25	0·62	0·31
Q 4/5	179	810,000	20·00	10·00	1·25	2·50	0·62	0·62	0·00
Q 4/10	188	854,000	10·00	2·50	5·00	5·00	1·25	1·25	0·00
Average levels:			14·50	13·37	4·81	3·96	1·42	0·63	0·12

made in terms of growth as shown by change of colour of indicator from pink to yellow. A control series was included in each batch of tests, the dilutions being prepared from a sample of streptomycin of known concentration (usually 10 units per ml.). The concentration of streptomycin in each sample was calculated from the formula:

$$U = \frac{T.E. \times C.S.}{S.E.}$$

U = Unitage per ml. of sample
T.E. = Dilution of end point in test sample
S.E. = Dilution of end point in standard sample
C.S. = Unitage per ml. of standard sample.

Samplings.—As a general rule, blood samples were drawn at 15 and 30 minutes then at one, two, three, four, six, eight and 24 hours after injections. Urine samples were taken when available. No attempt was made to measure total urinary output.

TABLE IX

AMOUNT OF STREPTOMYCIN IN UNITS PER MIL. IN THE BLOOD SERUM OF COWS AFTER THE INTRAVENOUS ADMINISTRATION OF 10,000 UNITS PER KILOGRAM BODYWEIGHT

Cow Ref. No.	Dose	Hours after injection						
		¼	½	1	2	4–5	6–8	24
Q 2/58	4,000,000	2·5	5·0	2·5	2·5	1·25	0	0
Q 2/61	3,800,000	5·0	5·0	10·0	2·5	0·62	0	0
Q 4/27	3,630,000	10·0	5·0	2·5	1·25	0·30	—	0
Q 4/23	3,180,000	5·0	>40·0	1·25	1·25	0·30	—	0
Average levels:		5·6	13·75	4·06	1·87	0·62	0	0

RESULTS:

Intravenous Administration.—The blood serum levels obtained by this route of injection are tabulated in Table V for calves and Table IX for cows. In Table V the results are irregular particularly as between different calves; thus calf Q 1/79 showed no detectable streptomycin in its serum 15 minutes after injection, whereas calf Q 1/76 A had a level of 40 units per ml. at that time. Calf Q 1/71 showed two distinct peaks, one at 30 minutes (40 units) and one at two hours (20 units) with an intervening value of 5·00 units at one hour.

Nevertheless, the trend in levels is reasonably clear. An average peak of 13 to 14 units was achieved in the first 30 minutes after injection, which declined over the next two hours (5 to 4 units) until at the fourth to fifth hour it averaged 1·42 units. Between the sixth and seventh hour the average was 0·63 units per ml. At 24 hours the average value was 0·12 units but the individual results were very irregular and several calves had no measurable streptomycin. For practical purposes it may be considered that the intravenous administration of 10,000 units per kilogram bodyweight to calves will result in measurable amounts of streptomycin in blood serum for a period of six hours. The averaged results in calves are graphed in Figure 1.

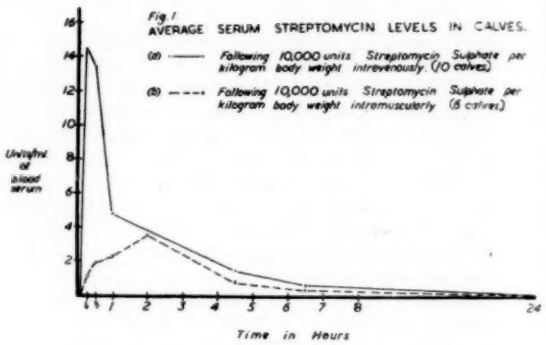
Fig. 1
AVERAGE SERUM STREPTOMYCIN LEVELS IN CALVES.
(a) Following 10,000 units Streptomycin Sulphate per kilogram body weight intravenously. (10 calves)
(b) Following 10,000 units Streptomycin Sulphate per kilogram body weight intramuscularly (5 calves)
Units/ml of blood serum
Time in Hours

The results obtained in four cows are presented in Table IX. In this series the results were more consistent except for an abnormally high value (40 units) in cow Q 4/23 at 30 minutes. It would appear that the standard dose of 10,000 units per kilogram bodyweight in cows does not produce the same high levels in the first two hours which it does in calves and that measurable levels do not persist for longer than five hours.

Intramuscular Administration.—The individual blood serum values again varied considerably between different calves, as shown in Table VI, but on the average the level rose to a peak of 3·5 units at two hours which fell to an average of 0·67 units between four and five hours. Between

TABLE X

AMOUNT OF STREPTOMYCIN IN UNITS PER MIL. IN THE BLOOD SERUM OF COWS AFTER THE INTRAMUSCULAR ADMINISTRATION OF 10,000 UNITS PER KILOGRAM BODYWEIGHT

Cow Ref. No.	Dose	Hours after injection						
		¼	½	1	2	4–5	6–8	24
Q 2/80	3,500,000	—	0·62	2·5	5·0	—	0·62	0
Q 4/14	3,630,000	1·25	1·25	1·25	2·5	2·5	0	0
Q 4/19	3,630,000	0·30	2·50	0·60	1·25	5·0	2·5	0
Average levels:		0·77	1·45	1·45	2·91	3·75	1·10	0

TABLE VI

AMOUNT OF STREPTOMYCIN IN UNITS PER MIL. IN THE BLOOD SERUM OF CALVES AFTER THE INTRAMUSCULAR ADMINISTRATION OF 10,000 UNITS STREPTOMYCIN PER KILOGRAM BODYWEIGHT

Calf Ref. No.	Body weight in lbs.	Dose in units	Hours after injection						
			¼	½	1	2	4–5	6–7	24
Q 1/73	144	700,000	1·25	2·50	2·50	2·50	1·25	0·00	0·31
Q 1/97	128	512,000	—	—	2·50	2·50	0·62	0·31	0·31
Q 2/46	294	1,330,000	0·62	0·62	0·62	2·50	0·62	0·31	0·00
Q 2/84	202	900,000	0·08	0·15	0·31	—	0·31	0·15	0·00
Q 2/88	265	1,200,000	2·50	5·00	2·50	5·00	0·62	0·31	0·00
Q 4/1	154	700,000	1·25	1·25	5·00	5·00	0·62	1·25	0·00
Average levels:			1·14	1·90	2·24	3·500	0·67	0·39	0·10

six and seven hours the average value was 0·39 units but it must be pointed out that one calf, Q 1/73, had no detectable level at this time. The averaged results are graphed in Fig. 1.

The results in cows presented in Table X are based on only three animals but the same tendency is shown. The peak value (3·75 units), however, occurred at four to five hours; at six to eight hours the average figure was 1·10 units but one out of the three cows gave negative values.

Intramuscular administration of this dose (10,000 units per kilogram bodyweight) resulted in a blood serum level of between 1 to 20 units on the average for the first two to three hours, a peak value being achieved at about the third hour; the levels then declined until at about six hours they became irregular and in some animals were not detectable.

Excretion via the Urine.—In these experiments we have not studied the excretion of streptomycin in urine on a quantitative basis, as it has not been possible to collect total urinary output over the 24-hour period of study.

The results following intravenous administration are tabulated in Table VII and those resulting from intramuscular administration in Table VIII.

TABLE VII

AMOUNT OF STREPTOMYCIN PER MIL. OF URINE IN CALVES AND COWS AFTER THE INTRAVENOUS ADMINISTRATION OF 10,000 UNITS STREPTOMYCIN PER KILOGRAM BODYWEIGHT

Reference number		Hours after administration				
		0–1	1–3	3–6	6–9	24
Q 1/89	Calves	113·6	37·8	340·7	37·8	0·16
Q 2/23	Calves	>1538·0	>1538·0	18·9	18·9	0·00
Q 2/28	Calves	0·00	>769·0	341·8	113·9	0·00
Q 2/38	Calves	2050·0	2050·0	683·4	227·8	8·47
Q 4/5	Calves	0·16	—	113·3	339·9	3·81
Q 4/10	Calves	>6152·0	>6152·0	>6152·0	683·0	25·30
Q 4/23	Cows	>1537·0	>1537·0	>1537·0	57·0	0·80
Q 4/27	Cows	>1537·0	>1537·0	>1537·0	171·0	6·30

TABLE VIII

AMOUNT OF STREPTOMYCIN PER MIL. OF URINE IN CALVES AND COWS AFTER THE INTRAMUSCULAR ADMINISTRATION OF 10,000 UNITS STREPTOMYCIN PER KILOGRAM BODYWEIGHT

Reference number		Hours after administration				
		0–1	1–3	3–6	6–9	24
Q 1/97	Calves	0	> 764·0	28·5	0	0
Q 2/46	Calves	342·0	1025·0	38·0	342·0	114·0
Q 2/84	Calves	256·4	>512·8	>512·8	0	0
Q 2/88	Calves	0·94	>615·2	>615·2	75·8	0
Q 4/14	Cows	>3076·0	>3076·0	1025·0	1025·0	12·6
Q 4/19	Cows	12·6	341·7	113·9	113·9	12·6

Obviously the amount of streptomycin excreted in urine will vary with the frequency of micturition and the total volume of urine voided on each occasion. For these reasons it seemed that no useful purpose would be served by calculating average results. It is quite clear from Table VII that streptomycin was excreted in urine in high concentration after intravenous injection for at least eight hours and that in some animals streptomycin was still present in appreciable amounts at 24 hours (Animals Q 2/38, Q 4/5, Q 4/10 and Q 4/27).

A similar picture was obtained following intramuscular injection although as was to be expected peak values did not rise quite so quickly.

Levels in Milk.—Milk samples taken at intervals were assayed for streptomycin following intravenous injection in four cows and following intramuscular injection in three cows.

In two of the four cows treated intravenously, levels ranging from 0·6 to 1·25 units were obtained between the second and ninth hour after administration. In the other two cows no streptomycin could be detected in the milk at any time during the 24 hours.

One of the three cows injected intramuscularly gave a single value at eight hours of over 1·25 units per ml. but the remainder of the results were negative. Observations were made on three cows following the direct administration of streptomycin up the teat canal, by the so-called direct infusion method. The results are presented in Table XI. The dose per quarter employed was large and it resulted in high levels for six hours. The cows were milked between the sixth and seventh hour after administration. In the two cows in which observations were continued these high levels were still present after the first milking and in one cow there was a level of 5·62 units per ml. 24 hours later when the cow had been milked twice.

Although blood sera from these three cows were assayed there was no evidence that streptomycin had reached the blood from the udder.

From these limited observations it would appear that the direct infusion of streptomycin up the teat canal will give rise to appreciable levels in the milk over at least eight hours and that parenteral administration is not likely to result in concentrations of streptomycin of therapeutic value with any degree of regularity.

Oral Administration.—Six calves were drenched with streptomycin at the standard dosage rate of 10,000 units per kilogram bodyweight. In none of these animals was it possible to demonstrate streptomycin in the blood sera over a 24-hour period. The excretion of streptomycin in the faeces was quite unpredictable. In one calf 40 units per gramme of faeces was measured ten hours after administration and in another, 80 units at 27 hours; in a third ten units was measured at nine hours. In two calves whose faeces were tested at 24, 30 and 48 hours no streptomycin

TABLE XI

AMOUNT OF STREPTOMYCIN IN UNITS PER MIL. IN THE MILK OF COWS AFTER THE INTRAMAMMARY INFUSION OF STREPTOMYCIN

Cow Ref. No.	Dose in units per quarter	Hours after administration						
		1	2	4–6		7–8		24
Q 2/64	240,000	>80·0	>80·0	>80·0	Cows milked	—	Cows milked	—
Q 2/68	240,000	>320·0	>320·0	>320·0	Cows milked	80·0	Cows milked	0·0
Q 2/72	250,000	455·0	455·0	455·0	Cows milked	151·9	Cows milked	5·62

was demonstrated. Obviously the rate of excretion will depend on the contents of the intestinal tract and rate of peristalsis.

Oral administration may result in local concentrations of streptomycin in the intestinal tract but this method of administration is of no value in obtaining blood levels.

DISCUSSION:

Our results obtained in bovines agree in large measure with the published findings in man and laboratory animals, but it has not been possible to reproduce the high and consistent blood levels obtained by Doll and Wallace (1948) in sheep following intramuscular injection. We would agree with Kornegay, Forgacs and Henley (1946) who found considerable variation in the blood levels in laboratory animals, as between different species and also in the same animal from day to day. These workers also found a variation in the disappearance of the drug from the blood at the end of the drug course.

It is possible to postulate certain infections of bovines which might be treated with streptomycin, on the usual assumption that the degree of sensitivity of organisms to this antibiotic *in vitro* may be related to the levels obtained in tissue fluids following injection.

On consideration of Table IV in Part I it will be seen that *C. pyogenes* and *Staph. pyogenes* exhibited a high degree of sensitivity to streptomycin (0·03 to 0·15 units per ml.) and the blood levels obtained at four to five hours after intravenous and intramuscular injection should be more than sufficient to achieve bacteriostasis.

Bact. coli, Past. septica and *C. renale* were somewhat more resistant but even at the upper limit of resistance of *C. renale* (0·62 units per ml.) these organisms would still be susceptible at about the same time interval after injection.

Salmonellae were considerably more resistant and it is doubtful if it would be practicable to maintain adequate concentrations in blood although administration of streptomycin by the mouth might be suitable for the treatment of enteric infections caused by these organisms.

It is generally agreed that the streptococci are resistant to streptomycin, as was found in this work, and that this antibiotic is unsuitable for the treatment of streptococcal infections.

Streptomycin first came into prominence as a tuberculocide and much of the literature has been devoted to its use in tuberculosis. It is clear that one drawback to its use in this disease is the ease and rapidity with which streptomycin resistant strains of tubercle bacilli develop during treatment, especially if the doses are inadequate or the duration of treatment unduly prolonged. Owing to the prevalence of tuberculosis in bovines in this country, this risk is one which must be borne in mind if streptomycin is to be used in veterinary practice. In our opinion there is a possibility that tuberculous animals might be treated with streptomycin for some other inter-current infection and inadvertently give rise to resistant bovine strains of tubercle bacilli which could be passed on to man by the usual channels of infection. Certainly trials of streptomycin should be limited in the first place to attested herds.

On theoretical grounds it is possible that *Myco. johnei* may be susceptible to streptomycin, but arguing on analogy with *Myco. tuberculosis* it is probable that the duration of treatment necessary would make it uneconomic.

From our results there appears to be an *a priori* case for the trial of streptomycin treatment of pyogenic infections in bovines caused by *C. pyogenes*, although it should be pointed out that *in vitro* tests of the sensitivity of *C. pyogenes* to penicillin are misleading. Downham, Christie and Hughes (1947) have stated that such tests are no guide to the clinical response to penicillin. The same may be true of streptomycin and *C. pyogenes*.

The common bovine pneumonias associated with *C. pyogenes* and pasteurella might respond to streptomycin therapy. The "white scours" syndrome in calves associated with *Bact. coli* infection, especially at the septicaemic stage, would appear to be a suitable condition for the trial of the drug.

Streptomycin treatment is certainly indicated in mastitis caused by *Bact. coli* and it has been favourably reported on by Schalm (1948), Lipman (1948) and Bryan *et al.* (1950).

Finally, it would seem, in view of the high urinary excretion of streptomycin and the relative susceptibility of *C. renale*, that pyelo-nephritis caused by that organism might be resolved with this antibiotic. Garrod (1948) has presented evidence that streptomycin is bactericidal and he suggested that short periods of treatment, 24 hours or less, are indicated in urinary infections.

Accumulated experience in antibiotic therapy shows that many factors are involved other than sensitivity of the organisms to the particular antibiotic concerned and the correct concentrations in tissue fluids. Obviously all these suggestions need clinical trial in bovine practice supported by bacteriological data, but it is considered these preliminary studies indicate the infections of bovines most likely to respond to streptomycin and the methods by which it may be administered.

SUMMARY

The comparative *in vitro* resistance of a number of bacteria to streptomycin has been studied and the order of descending resistance has been found to be as follows: Streptococci, Salmonella, *Erysipelothrix rhusiopathiae, Ery. monocytogenes, C. renale,* Pasteurella, *Bact. coli, Staphylococcus pyogenes, C. pyogenes.*

Streptomycin has been administered to calves and cows by the intravenous, intramuscular and oral routes as well as by intramammary infusion. The levels of streptomycin in blood and milk obtained by these methods and data on its excretion in urine are given.

The possible uses of streptomycin in bovine practice, based on these results, are discussed.

Acknowledgments.—Our thanks are due to Sir Jack Drummond, F.R.S., for permission to publish these results and to Miss J. Blomfield for her technical assistance.

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KETOSIS OF DAIRY COWS HOUSED IN COURTS AND IN BYRES

BY

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Ketosis, whether occurring as a result of starvation, intercurrent disease, faulty diet or for any other reason, is indicative of disordered metabolism. Clinical ketosis and ketonaemia and ketonuria in clinically normal dairy cows occur most commonly when the animals are housed during the winter and early spring months, disappearing when they are turned out to pasture in the spring. The hypotheses made and the experiments carried out to explain the occurrence of ketosis have been concerned almost exclusively with possible dietetic causes, but the rapid disappearance of ketosis when animals are turned out to pasture has not been adequately explained in terms of diet. Little attention has been given to other factors affecting the cattle that may be concerned with the occurrence of ketosis and recovery from it. After the close confinement of the stall the freedom of movement at pasture might well be expected to stimulate metabolism, and, coupled with access to an appetising food, this freedom may be reflected by enhanced bodily fitness and recovery from ketosis.

In the predominantly arable farming areas of East Scotland a number of dairy herds are housed in courts formerly used for store cattle. In this court system of dairying the cows are tied or yoked during milking and feeding, but at all other times they are free to move within the confines of the covered court in which they are housed. By contrast, cows kept in byres are tied or yoked continuously except for the short walk to and from the milking parlour where parlours are used.

Forrest, 1946, a pioneer in the court system of dairy farming, claims that, among other advantages of the system, better health is enjoyed by the animals and this claim is widely supported by farmers who have adopted the system. Forrest writes, "The difference in health is particularly noticeable in autumn calving heifers which often, in their first three months in a byre, get a very worn appearance."

When tuberculosis-free animals in courts and byres are fed with comparable rations and according to milk production requirements, measurable difference in the standard of health may be attributed to the system of housing. The occurrence of ketosis was used as an indicator by which to assess the relative health of tuberculosis-free herds housed in courts and in byres, the evidence being obtained from the examination of milk samples and from clinical histories.

From the end of January, 1948, until the latter half of the following April when the cows were turned out to grass, tests were made each fortnight on a composite milk sample taken from each cow that had been calved for not longer than ten weeks and notification was received of cases of ketosis diagnosed by the veterinary surgeon among cows whose milk was being tested. The Rothera test as described by Paterson was made on the milk samples, positive results being recorded as from + to ++++ according to the intensity of the colour reaction.

In the following season 1948-49 the observations were extended to more herds and the milk samples were tested at weekly intervals. The observations started early in November and were completed at the end of March when, owing to the mild season, a number of the herds were allowed access to pasture.

Summaries of the results of the Rothera tests on the milk samples are given in Tables I and II. (OVER-LEAF).

The percentages of reacting samples from each herd examined in winter 1948 are given in the following table:—

Herd	Total number of samples	% reactions of + or over	% reactions of ++ or over	% reactions of +++ or over
Court herds, winter 1948				
C1	65	84·6	20·0	0·0
2	45	62·3	22·2	8·9
3	30	76·7	13·3	0·0
4	35	42·9	8·6	2·9
5	21	52·4	9·5	4·8
Byre herds, winter 1948				
B1	234	66·2	20·1	8·5
2	157	61·8	17·2	8·3
3	52	63·5	11·5	5·8

A comparison of the means of these percentages gives the following result:—

	Mean percentages		
	+ or over	++ or over	+++ or over
Court 5 herds	63·8 ± 6·3	14·7 ± 2·5	3·3 ± 1·4
Byre 3 herds	63·8 ± 8·1	16·3 ± 3·2	7·5 ± 1·8
Difference	0·0 ± 10·2	1·6 ± 4·1	4·2 ± 2·3

None of these differences is significant but there is a distinct tendency for more definite reactions to occur in samples from the byre herds than in samples from court herds.

In autumn/winter 1948-49 the percentages of reactions were very much lower and only those for + and over are compared, the more definite reactions being too few to give reliable results.

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TABLE I

SHOWING THE RESULTS OF ROTHERA TESTS ON MILK SAMPLES COLLECTED AT FORTNIGHTLY INTERVALS FROM THE LAST WEEK OF JANUARY UNTIL THE END OF APRIL, 1948, FROM COWS THAT HAD BEEN CALVED FOR NOT LONGER THAN TEN WEEKS

Herd	Court herds — Number of samples					Herd	Byre herds — Number of samples				
	Neg.	+	++	+++	++++		Neg.	+	++	+++	++++
C1	10	42	13	—	—	B1	79	108	27	11	9
2	17	18	6	4	—	2	60	70	14	9	4
3	7	19	4	—	—	3	19	27	3	3	—
4	20	12	2	1	—						
5	10	9	1	1	—	Total	158	205	44	23	13
Total	64	100	26	6	—						

TABLE II

SHOWING THE RESULTS OF ROTHERA TESTS MADE ON MILK SAMPLES COLLECTED AT WEEKLY INTERVALS FROM THE BEGINNING OF NOVEMBER, 1948, TO THE END OF MARCH, 1949

Herd	Court herds — Number of samples					Herd	Byre herds — Number of samples				
	Neg.	+	++	+++	++++		Neg.	+	++	+++	++++
C1	324	4	3	—	1	B1	621	33	3	—	1
2	136	1	—	—	—	2	499	10	11	1	1
3	273	14	4	2	—	3	144	10	2	—	—
4	157	3	1	—	—	4	239	10	2	—	—
5	157	4	2	1	—	5	296	2	1	—	—
6	221	1	—	—	—	6	189	7	2	2	—
7	79	—	—	—	—	7	495	28	23	5	—
8	107	—	1	—	—						
9	685	8	1	—	—	Total	2,483	100	44	8	2
10	779	8	2	—	—						
Total	2,918	43	14	3	1						

Court herds, autumn/winter 1948–49

Herd	Total number of samples	% reaction of + or over
C1	332	2·5
2	137	0·7
3	293	6·8
4	161	2·5
5	164	4·3
6	222	0·5
7	79	0·0
8	108	0·9
9	694	1·3
10	789	1·3

Byre herds, autumn/winter 1948–49

Herd	Total number of samples	% reaction of + or over
B1	658	5·6
2	521	4·2
3	156	7·7
4	251	4·8
5	299	1·0
6	200	5·5
7	551	10·2

Mean percentages + or over

Court 10 herds	2·07 ± 0·76
Byre 7 herds	5·60 ± 0·91
Difference	3·53 ± 1·91

$$t = \frac{3{\cdot}53}{1{\cdot}19} = 2{\cdot}97 \qquad 15 \text{ d.f.} \qquad P = 0{\cdot}01$$

Thus, in 1948-49, a significantly greater number of reactions occurred in samples from byre herds than occurred in samples from court herds.

In the early part of 1948 there was no clinical ketosis in the court herds and in the following season two cases only were reported. Over the same periods 12 and 17 cases of clinical ketosis were recorded in the byre herds.

By whichever criterion a comparison is made, whether clinical ketosis or one or other degree in the reaction of milk to the Rothera test, the result favours the court herds. If freedom from ketosis be evidence of bodily efficiency and health in the recently calved dairy cow the cows housed in courts were healthier than those housed in byres. It is probable that the liberty of movement enjoyed in the courts was responsible for the relatively low incidence of ketosis.

In the first season a high percentage of milk samples, whether from cows in courts or in byres, gave a positive reaction in some degree. The percentage of positive reactions in the second season was much smaller. In view of the high incidence of ketosis reported in veterinary journals the first season's results were the more expected. In Britain, Boddie (1933) found a progressive increase in the percentage of clinically normal cows with ketonuria, from 31 per cent. in January to 100 per cent. in April. Eden and Green (1940) examined blood samples from a

herd of 60 cows in the summer and winter. In the winter 70 per cent. of the cows showed a considerable increase in blood ketones above the summer values. Similar reports on the high incidence of non-clinical ketosis come from the U.S.A. (Duncan, Huffman and Tobin (1939); Sykes, Duncan and Huffman (1941) ; Patton (1944).)

The low figures obtained for both court and byre herds in the second season were probably exceptional and may have been related to the unusual mildness of that winter, the mean temperatures at Edinburgh for the months of November, December, January and February in 1948-49 being 2·6, 1·9, 2·9 and 2·4 degrees Fahrenheit higher than those for the corresponding months of the previous winter and 3·4, 2·4, 2·0 and 2·6 degrees higher than the mean temperature for these months over a prolonged period.

Summary and Conclusions

Clinical ketosis and sub-clinical ketosis are commoner in cows housed and tied or yoked in byres than in cows housed in courts with liberty of movement within the court.

Ketosis is indicative of subnormal health, therefore any system of management that reduces the incidence of ketosis is favourable to the maintenance of bodily fitness and health.

The court system of dairying reduces the incidence of ketosis and where existing facilities permit or where new buildings are to be constructed preference should be given to the court system.

Acknowledgments.—We express our indebtedness and thanks to the following veterinary surgeons for their co-operation and help: Messrs. G. R. Jamieson and J. Ralston, J. B. Mackie, A. McTurk and N. W. Keith, J. Milne, W. J. B. Robson, and H. M. Wilson. Thanks are also due to those farmers and dairymen who supplied milk samples and information, and to Dr. D. N. Lawley for statistical guidance.

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BIRD SANCTUARIES IN NORTHERN IRELAND

Seventeen islands and islets at the northern end of Strangford Lough, Northern Ireland, as well as the lake in the Rosemount demesne, Greyabbey, will be bird sanctuaries for the next five years or so. This is the effect of an order made recently by the Minister of Home Affairs in pursuance of the Government policy that further protection should be afforded to wild birds.

The islands and islets coming within the scope of the order are: Boretree East, Boretree West, Chandries, Gabbock, Sheelah's, South Sheelah's, Peggy's, North Boretree Rock, West Boretree Rock, South Boretree Rock, Gull Rock, Turley Rock, Shaup Rock, Salt Rock, Jane's Rock, Ragheries, Selk Rock.

The Minister's action has the support of the owner of the islands (Major H. E. Montgomery) and of the Chairman of the Wild Birds Advisory Committee for Northern Ireland (Mr. Josias Cunningham).

* * * * *

Weekly Wisdom

Man in this moment of his history has emerged in greater supremacy over the forces of nature than has ever been dreamed of before. He has it in his power to solve quite easily the problems of material existence. He has conquered the wild beasts, and he has even conquered the insects and the microbes. There lies before him, if he wishes, a golden age of peace and progress. All is in his hand. He has only to conquer his last and worst enemy—himself. With vision, faith, and courage, it may still be within our power to win a crowning victory for all.—Mr. Churchill, House of Commons speech, March 28th, 1950.

THE VETERINARY RECORD

May 6, 1950

STREPTOMYCIN

IT is only a little over ten years ago that the therapeutic possibilities of penicillin were fully realised. Since that time, research on antibiotics has increased steadily until to-day hundreds of scientists are investigating this new field and extensive screening tests for antibiotic production from bacteria, fungi, plant extracts and the like, continue on an ever widening scale.

The earlier products, such as penicillin and tyrothricin, were active mainly against the Gram positive organisms. With the discovery of streptomycin by Waksman in 1944 it was felt that a new and promising step forward in antibiotic therapy had been taken, for streptomycin was found to be active against a much wider range of bacteria. However, its chief appeal was due to its demonstrable effect in experimental tuberculosis. Clinical research on its use has been concentrated, in the first few years, on human tuberculosis. With increasing experience, it became clear that despite its undoubted effect in certain types of tuberculosis in man, particularly tuberculous meningitis, streptomycin suffered from a number of drawbacks. Treatment had to be prolonged for a considerable time and, unfortunately, it was found that resistant strains of tubercle bacilli were produced very easily during such treatment. Nevertheless, streptomycin has a definite place in antibiotic therapy when used with discretion.

With improvements in the supply position, streptomycin is now likely to be available for veterinary use and in this issue we publish an article devoted to its possible implications when used in veterinary practice. It would seem from experience in humans that the dose and duration of treatment would render the drug quite unsuitable for the treatment of tuberculosis in anything but the most valuable of animals, although it is very doubtful whether it is ever justifiable to treat a known case of tuberculosis in a domestic animal. It is tempting to hope that this antibiotic might have a favourable effect on cases of Johne's disease. Again, it is probable that the dosage and the length of time required will render the drug uneconomic. Nevertheless, controlled clinical trials on its use in this condition would be of interest.

There are other infections in domestic animals in which streptomycin treatment may have a definite place. The authors of the article in this issue draw attention to the possible risks of inadvertently using this antibiotic in animals affected with tuberculosis, and in so doing, giving rise to resistant strains of tubercle bacilli. We feel that there is much to be said for their recommendation that if the drug is to be used in bovine practice it would be wise to restrict its use to attested herds until we know more surely than we do at present whether this risk is likely to materialise under conditions of practice.

Finally, it will be realised that already there are other antibiotics, particularly aureomycin and chloromycetin (chloramphenicol), which hold out particular promise in the treatment of many infections caused by Gram negative bacteria and even organisms as small as the rickettsiae. There can be no question that within the next few years the veterinary surgeon will have at his disposal at least five or six antibiotics active against a very wide range of infections. Let us see that they are used wisely.

CLINICAL COMMUNICATION

OBSERVATIONS ON STAPHYLOCOCCAL INFECTIONS IN THE DAIRY GOAT

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The dairy goat assumes a very important role in the livestock industry of Barbados, where it is estimated that there are over 16,000 with a daily milk production of approximately 1,000 gallons. Accordingly, it is to be expected that diseases of various forms would occur amongst these animals and the purpose of this publication is to record observations on two cases of staphylococcal infections as manifested by (1) mastitis (2) orchitis.

The individual case histories are as follows:—

MASTITIS.—The subject was an adult pure-bred British Saanen doe in mid-lactation, producing about five pounds (5 lb.) of milk daily. The attack, a sudden one, was located in the left half of the udder. Symptoms observed were (1) decreased milk supply, (2) heat and tenderness in the affected half, (3) slight elevation of temperature, (4) the corresponding supra-mammary gland was palpable but not sensitive on palpation. Milk samples were drawn from the affected half and cultured on blood agar plates which yielded a non-haemolytic staphylococcus. Treatment comprised frequent milkings and sulphamezathine therapy, 200 grains *per orem* as an initial dose followed by 100 grains on the second, third and fourth days. The response to this treatment was most unsatisfactory and the condition passed through a very acute stage very rapidly: the accompanying photograph shows the result of the infection, leaving an atrophied and non-secreting half of the gland in its wake.

British Saanen Doe: Atrophied and non-secreting left half of the udder resulting from staphylococcal infection.

ORCHITIS.—The subject was an adult pure-bred British Alpine buck standing at stud. The condition was first observed when the animal was being exercised when it was noticed that there was pain and discomfort on walking; further examination disclosed that both the right testicle and spermatic cord were swollen and very sensitive to handling. This condition is well illustrated in the accompanying photograph. Concurrent with these changes there was a slight elevation of temperature and decreased appetite. The condition became progressively worse and an unfavourable prognosis as to the future breeding value of the buck was given. Accordingly, the animal was slaughtered and a *post-mortem* examination made of the testicles. It was found that both were involved with a well-established abscess in the right epididymal region from which a pure culture of *Staphylococcus aureus* was obtained. The opinion is expressed that the infection was acquired at time of service, as there were no otherwise noticeable portals of entry.

British Alpine Buck: Showing involvement of right testicle.

Acknowledgment.—I am indebted to Dr. W. R. LeGrow, Extension Department, Ontario Veterinary College, for having identified the non-haemolytic staphylococcus.

SENSITIVITY TO PENICILLIN

At a recent meeting the Council on Pharmacy and Chemistry of the American Medical Association (*J. Amer. Med. Ass.*, 1950, **142**, 339) decided to omit from New and Non-official Remedies all penicillin preparations for local application, whether marketed as liquids, ointments, or ophthalmic ointments, on the ground of the danger of sensitivity. There are an increasing number of instances of sensitisation to topical penicillin preparations and in the next N.N.R. a notice is to appear warning users of the danger. No release of penicillin for counter sales is recommended. The status of penicillin inhalation therapy was also discussed and the occurrence of sensitivity associated with the use of the antibiotic in aerosols, inhalants and similar preparations is to be investigated.—*Pharm. J.*

* * * * *

MEDICAL SAFEGUARDS AGAINST X-RAYS

Handbook 41 of the United States National Bureau of Standards, entitled "Medical X-ray Protection up to Two Million Volts" (pp. 43; Washington, D.C.: Gov. Printing Office, 1949; 15 cents), supersedes Handbook 20, which was last revised in 1936. The increasing use of high-energy X-rays in medical diagnosis and treatment has presented new problems in all phases of radiation protection; and recommended standards of safety, intended primarily for the protection of the radiation worker and not for the patient, are concisely set forth in the new handbook. Rules are given for working conditions, survey and inspection of installations (fluoroscopic and fluorographic, dental, diagnostic and therapeutic) and structural details of protective barriers, and a chapter is devoted to electrical protection. Useful tables, graphs and instructions for determining the thicknesses of protective barriers and the distances required for protection in air are included. The permissible dosage-rate is taken as 0·300 roentgen per week.—*Nature.*

ABSTRACTS

[Streptomycin Concentrations in Milk following Insertion of Streptomycin Bougies into the Bovine Udder. Trussell, P. C., & Stevenson, W. G. (1949.) *Canad. J. comp. med.* **13. 8.** 209–212.]

The authors have undertaken studies on the persistence of streptomycin sulphate in the bovine udder following the insertion of soluble bougies containing 10,000 or 25,000 U.G. The level of streptomycin sulphate was assayed in milk at varying times after insertion of the bougies. Satisfactory levels are obtained by repeating the treatment at 6–12 hourly intervals. Such treatment provides levels considerably in excess of 8 U.G. per ml. which is the critical level for the majority of *Bact. coli* strains. It should be pointed out that the sensitivity of strains of *Bact. coli* varies considerably. The high level obtained with this treatment also has an effect on other organisms including *Str. agalactiae*. There was no evidence of irritation to the udder.

D. L. H.

* * * * *

[Diagnosis and Control of Mange in Dairy Cattle. Schwardt, H. H. (1949.) *J. Econ. Ent.* **42.** 444–446.]

This report covers three years' work in north-eastern United States on the diagnosis and control of mange in dairy cattle, a condition found to be more common than is generally realised, and one, it is emphasised, that should not be confused with others such as stephanofilariasis and pediculosis. Mange can be diagnosed by taking deep skin scrapings, which may be examined immediately, or the material may be treated by heating to nearly boiling point in 30 to 50 cc. of 10 per cent. KOH or NaOH. This treatment destroys hair, particles of skin, etc., and leaves the exoskeleton of the mites intact. After centrifugation the sediment is washed several times, mixed with a sugar solution and recentrifuged to float up the mites. Affected cattle were treated by spraying equipment, using a pressure of 400 lb. per sq. in. Dipping was impracticable because of the small numbers of cattle on each farm. The animals were sprayed in their stanchions and, to ensure a complete coverage, two gallons of spray were applied to each animal. Lime sulphur solution, wettable sulphur, wettable sulphur and rotenone, and benzene hexachloride were used. Four weekly treatments with the first three preparations were necessary to ensure a complete cure.

A total of 448 cattle in 13 herds were treated with benzene hexachloride. In the first group, involving five herds, the chemical was used at a strength of 0·2 per cent. B.H.C. as a single dressing. An immediate improvement was noted in all the herds, but in three mange recurred within six weeks. In the second group eight herds were treated with one dressing of 0·3 per cent. B.H.C., and mange also recurred in three of them. The author concludes that at least two dressings with this chemical at a strength of 0·3 per cent. B.H.C. will be necessary to eradicate mange.

[Work in Britain on the control of cattle mange has shown that two dressings at a strength of 0·25 per cent. B.H.C. is necessary in practically all cases of infestation. The best interval between treatments would appear to be about ten days.]

G. C. B.

Erratum.—Vet. Rec. **62.** 51; *Supplement* **11.** 48: *For* "Sperman" *read* "Sherman" in title of thesis upon which Mr. G. C. Knight was awarded his diploma of Fellowship, R.C.V.S.

QUESTIONS AND ANSWERS

The submission of questions for inclusion in this column will be welcomed; they can relate to any aspect of veterinary work. For purposes of record, each question is numbered, and those submitting questions are required to furnish (not for publication) name and address.

Answers to readers' queries represent exclusively the personal opinions of the writers, and criticism of the replies will be appreciated.

All communications should be addressed to the Editor.

Complete Infertility in a Bull

Q. 351.—*A 17-month-old Ayrshire bull has a record of complete infertility. Clinical examination some four months ago revealed no abnormality, and a cow was seen to be served normally. Examination of the semen revealed sperms to be motile, uniform and in normal numbers. A second examination about two months ago revealed what was considered to be a very good sample of semen, with vigorous sperms of good shape, and present in large numbers. At a third and recent examination the sperms were seen, with very few exceptions, to be dead, although present in normal numbers and perfectly formed. The bull has at no time had too much to do, and has been used at fairly regular intervals first on the farm at which he was bred, and latterly on another in a different district, and with a different system of management. Can you suggest a possible solution and treatment; or any further line of investigation?*

A.—The history of this case is not at all uncommon. There is, unfortunately, no clear indication of the length of time the bull has been on the second farm and of the actual ration he has received on this farm. Presumably he has been there for a sufficiently long time to ensure that psychological factors related to transport and strange environment are not operating.

There are many reasons why such a bull will produce semen containing many dead spermatozoa after previously giving semen of good quality.

In this particular case a careful clinical examination should be made for abnormalities of the testes and the accessory sex organs. If the examination reveals inflammatory changes in the genitalia or a hypoplasia of one or both testes, the prognosis is grave. Failing the discovery of pathological changes attention should be paid to the bull's feeding and housing. He should receive adequate amounts of starch and protein for an adolescent bull of his weight. Care should be taken to ensure that he receives sufficient vitamin A or its precursor either in the form of green food, dried grass or cod liver oil. Until the bull is again producing good quality semen he should be housed in a warm, draught-proof box. After recovery he should still be housed in a warm, draught-proof bull pen or box unless it is necessary for him to run out with heifers.

. . . . . .

Tuberculin Testing in Pigs and Cattle

Q. 352.—*(a) Will you kindly enlighten me on the use of avian tuberculin when testing pigs for shows and sales. Some clients are under the impression that it is not necessary to use avian tuberculin.*

(b) With regard to tuberculin testing individual cattle, would it be permissible to use the Stormont test? At present, it seems rather farcical to interpret the result solely on the mammalian reaction.

A.—(a) Avian tuberculin need not be used for testing pigs, as a pig infected with the avian type *M. tuberculosis* will react to mammalian tuberculin.

(b) The Stormont test is said to detect the infected newly-calved cow as well as the desensitised animal, and there is no reason why it should not be used provided the Animal Health Division approves.

Reference

Dalling, T. *et al.* (1944.) *Vet. Rec.* **60.** 527-536.

Double Intradermal Tuberculin Testing in Pigs

Q. 353.—*Pig-breeding Societies are increasingly insistent upon the issue of veterinary surgeons' certificates that pigs have passed the double intradermal tuberculin test, as a condition of acceptance of entries at pig shows. Is there any standard application of this test to pigs, how should it be interpreted, and have you any information concerning its reliability?*

A.—A single injection of tuberculin is used. Two methods of application are available.

(1) 0·1 c.c. mammalian P.P.D. tuberculin is injected intradermally on the anterior border of the ear about a third of the way from the base. Readings are taken 72 hours after inoculation and any degree of swelling and discoloration is considered a positive reaction—no measurements are taken.

(2) 0·1 c.c. mammalian P.P.D. tuberculin is injected in the fatty tissue between the base of the ear and the neck. A similar quantity of avian tuberculin is injected in the same position behind the other ear. Readings are taken at 48 hours and the reactions assessed in the same manner as in method (1).

Both methods are reliable for detecting cases of bovine tuberculosis in pigs. In the writer's experience, using method (2), all reactors to mammalian tuberculin have yielded cultures of *mycobacterium tuberculosis* (bovine type) at *post-mortem* examination and avian reactors generally have proved to be infected with the avian type of organism. In rare cases, cultures have not been obtained from avian reactors, and this possibly supports the belief that other acid-fast infections may occur in pigs, sensitising them to avian tuberculin.

[A practitioner's experience of the use of the intradermal method was recorded in our issue of October 23rd, 1948 (*Vet. Rec.* **60**, 518).]

* * * * *

Abortion Following Sheep Worrying

Q. 354.—*How long after sheep have been worried by a dog would you expect to get abortion from this cause?*

The circumstances of the particular case, for which I am anxious to get an authoritative answer to this query, are—that a dog worried a flock of sheep as result of which one had to be destroyed. Fourteen days later one ewe aborted a dead lamb and was at the same time herself found dead. Post-mortem *examination revealed that there was considerable extensive peritonitis as a result of a rupture of the womb, resulting from disintegration in the womb of the infected dead foetus. A further three aborted lambs were found three weeks following the worrying by the dog, the ewes being all right.*

I would appreciate your opinion as to whether, in fact, ewes would continue to carry their lambs for a period of three weeks following being chased, before aborting?

A.—The respondent would have no hesitation in stating, from an unfortunately considerable experience, that ewes could, in fact, continue to carry their lambs for a period of three weeks following being chased, before aborting. The fact that in-lamb ewes more often than not go to full term after being chased does not invalidate this view.

Zoological Society of London.—At the annual meeting of the Society held on April 29th, with the Duke of Devonshire (President) in the chair, the following six Fellows were elected members of Council: Lieut.-Commander P. M. Scott, Professor J. B. Buxton, Mr. L. Harrison Matthews, Professor Charles H. O'Donoghue, Sir Francis O. Lindley, and Lieut.-Colonel Dealtry Part.

REVIEW

[Medical Protozoology. By CECIL A. HOARE, D.Sc. (LOND.). Published by Baillière, Tindall & Cox, 7 and 8, Henrietta Street, W.C.2. 1949. Price 35s.]

This is a very useful book which, in the author's own words, is primarily intended to fill a gap in the medical curriculum by providing students and practitioners of medicine with all the essential information regarding the protozoa living in man and the diseases caused by them. Its interest to the veterinarian lies chiefly in the comparative aspects of medical protozoology, in view of the part played by lower mammals as reservoir hosts of human protozoal infections.

References to various authors and the historical development of the present knowledge of the subject have been purposely omitted, so that this book comprises a most useful source of essentially factual information concerning the protozoa in man.

The work is divided into three parts, of which the first forms a particularly valuable introduction to the study of veterinary protozoology. The first part comprises a general account of protozoa including a chapter on their status, structure, reproduction and physiology. Chapter 2 deals with classification and includes relevant extracts from the International Rules of Zoological Nomenclature. Chapter 3 is concerned with ecology, and there is much information on such aspects as the distribution and mode of life of protozoa and their economic importance, the entozoic protozoa of man and host parasite relationships, transmission, host specificity, localisation in the body, biological races, infection and resistance. There is also a short section dealing with the action of drugs and the geographical distribution of protozoal diseases.

The second part is devoted to a systematic study of the protozoa of man and, because it is concerned essentially with human species, it is, with the exception of the chapters on the leishmanias and trypanosomes, of only passing interest to the veterinary student. There is, however, considerable information on the trypanosomes of man and animals, which is of great value to the veterinary reader.

The last part is confined to diagnostic methods, and here again, although the techniques described are primarily for the diagnosis of human infections, many of them are applicable to the detection of protozoal diseases of animals.

The book is well illustrated; the factual matter is very clearly and concisely arranged and includes some useful tables. In mentioning a small spelling error on page 83, where "multiple" should read "multiply," no criticism is intended of a book which is a very useful guide to the veterinary student, although the systematic contents are confined almost exclusively to the protozoa of man.

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Also received: "LES LAPAROTOMIES CHEZ LES BOVINS." (Docteur Vétérinaire A. Vicard.) 1st edition (1950), with 25 illustrations. Published by Vigot Frères, 23, Rue de l'Ecole-de-Médicine, Paris-VIe. No price stated.

DUTCH FRIESIAN IMPORT PLAN

At the recent annual meeting of the British Friesian Society Mr. J. E. Bennion, Chairman of the Council, announced that, following study by a delegation of breeding, management and organisation in Holland, the Council has decided that the breed in this country could benefit by the injection of some "very highly selective Dutch blood." Mr. Bennion added that the Ministry had agreed to the importation, on the Society's terms, and the Council would go ahead as soon as veterinary and other matters allowed.

QUESTIONS IN PARLIAMENT

Aureomycin (Supplies)

Mr. De la Bere (April 27th) asked the Minister of Agriculture whether he will take steps to test the claims made by leading industrial chemists that a small quantity of the new drug aureomycin, when mixed with a ton of animal feed, produces a 50 per cent. speed up in the growth of farm stock, and, so far as is warranted, make supplies available to livestock rearers throughout the country.

Mr. T. Williams: The hon. Member no doubt has in mind the addition of vitamin B_{12} in residues of aureomycin and streptomycin, to animal diets deficient in animal protein. Such deficient diets lead to a retarded growth rate in non-ruminant animals, and the addition of the vitamin in this way appears to enable the growth rate to return to that normally obtained from feeding-stuffs containing animal protein. This matter is already under investigation, more particularly at the National Institute for Research in Dairying. The results will be made known as soon as they prove of value to the agricultural community.

* * * * *

Milk-borne Infection

Mr. Hastings (April 27th) asked the Minister of Health how many outbreaks of infectious disease in 1948 and 1949 have been traced to milk; and in how many of these cases was the milk from tuberculin-tested herds, accredited or pasteurised, respectively.

Mr. Bevan: Information is not immediately available in this form, but I will look into the matter and communicate with my hon. Friend as soon as possible.

* * * * *

Horses (Export and Slaughter)

Mr. Sutcliffe (April 26th) asked the Minister of Food whether he has now given consideration to recommendations (*f*) to (*n*), and (*r*) of the Departmental Committee on the Export and Slaughter of Horses; and what action it is proposed to take.

Mr. Webb: Most of the recommendations to which the hon. Member refers could be implemented only by legislation, which it would be difficult to restrict to horse slaughtering. Consequently, wider questions of policy are raised, and I am consulting my right hon. Friend the Minister of Health about them.

Mr. Sutcliffe: Is the Minister aware that there is considerable urgency, in view of the questions of feeding and stabling of these horses? Will he do his best to expedite a decision?

* * * * *

Mr. Sutcliffe (April 27th) asked the Minister of Agriculture if he is yet in a position to indicate the result of his consultations with the British Transport Commission and the Road Haulage Association on the measures to be taken following the recommendations of the Committee on the Export and Slaughter of Horses, as regards amendments to the Exportation and Transit of Horses Order, 1921, and the Transit of Animals (Amendment) Order, 1931.

Mr. T. Williams: No, Sir. The recommendations of the Committee have been embodied in a draft Order which has been sent to the Railway Executive and the Road Haulage Association for their observations. I am awaiting replies from those bodies.

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Horse-flesh (Export Licences)

Mr. Sutcliffe (April 26th) asked the Minister of Food what action he intends to take with regard to the issue of a limited number of licences for the export of horse-flesh in order to keep the market open; how many licences have already been issued; and to whom.

Mr. Webb: None of these licences has yet been issued. We have received four applications, which I will deal with without delay.

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Gambia (Poultry Project)

Mr. Grimond (April 26th) asked the Secretary of State for the Colonies whether he has any further information as to when eggs may first reach this country from the Gambia Poultry Project; and what his estimate is of the total number of eggs which may be imported annually from Gambia when the scheme is in full operation.

Mr. Dugdale: We understand that both eggs and poultry will probably be available for import into this country next June. As regards the second part of this Question, the total number of eggs available for import when the scheme is in full operation is estimated at 20,000,000 a year.

Mr. Grimond: In view of the great possibilities of increasing egg production at home, and the difficulties with which I understand this scheme has met over soil erosion and vitamin deficiencies in the hens, does not the Minister feel that these eggs might be rather more easily got in our own country and that possibly Gambia might be helped more satisfactorily in other ways?

Mr. Dugdale: No, Sir. I think that this scheme is starting off very successfully, and I hope that it will succeed and produce more eggs for this country.

Mr. Russell: Is the Minister satisfied that there will be adequate feeding-stuffs available for this scheme?

Mr. Dugdale: As far as I know but, as far as possible, I should like questions of detail to be asked of the responsible body, which is the Colonial Development Corporation. I am only responsible here for questions of general principle.

Sir H. Williams: Has the right hon. Gentleman had his attention drawn to the fact that there has been a very great increase in the number of baboons in the Gambia territory which have consumed half the groundnut crop there, and will he take steps to see that they do not consume the eggs as well?

Colonel Crosthwaite-Eyre asked the Chancellor of the Exchequer how many dollars he has authorised to be expended by the Colonial Development Corporation in connection with the poultry scheme in Gambia.

Mr. Jay: Two hundred and sixty-two thousand four hundred and fifty.

NOTES AND NEWS

Diary of Events

May 6th.—Annual Meeting of the Association of Veterinary Officers, at the Royal Veterinary College, N.W.1, 2 p.m. Annual Dinner, 6 p.m.

May 9th.—Scientific Meeting of the Zoological Society of London, Regent's Park, N.W.8, 5 p.m.

May 10th.—Annual General Meeting of the National Veterinary Benevolent and Mutual Defence Society, at Manchester (The Midland Hotel), 2.30 p.m.

May 11th.—Annual General Meeting of the Dumfries and Galloway Division, N.V.M.A., at Carlisle (County Hotel), 11.15 a.m.

May 11th.—Meeting of the East Midlands Division, N.V.M.A., at Sutton Bonington, 2 p.m. (not 2.15 p.m. as intimated previously).

May 17th.—Meeting of the Royal Microscopical Society in the Hastings Hall, B.M.A. House, Tavistock Square, W.C.1, 5.30 p.m.

May 17th.—Spring Meeting of the Eastern Counties Division, N.V.M.A., at Colchester (Red Lion Hotel), 2.15 p.m.

May 18th.—Annual Meeting of the Society of Veterinary Practitioners, in the Holborn Restaurant, London, W.C.1, 2.30 p.m.

May 19th.—Annual General Meeting of the Sussex Division, N.V.M.A., at Brighton (Old Ship Hotel), 2.30 p.m.

May 24th.—Meetings of the Editorial Committee, N.V.M.A.: Executive, 1.30 p.m.; Main, 3 p.m.

May 25th.—Special Meeting of the South-Eastern Division, N.V.M.A., at Maidstone (Royal Star Hotel), 6.30 p.m.

May 26th.—Meeting of the Royal Counties Division, N.V.M.A., at Reading (Caversham Bridge Hotel), 2.30 p.m.

June 9th.—R.A.V.C. Annual Dinner, Grosvenor House, London.

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R.C.V.S. Examinations

May 9th.—R.C.V.S. Entries for D.V.S.M. Examinations due.

May 15th.—R.C.V.S. Pharmacology, etc., Examination (Revised Syllabus): Written Examination.

May 17th.—R.C.V.S. Pharmacology, etc., Examination (Revised Syllabus): Orals and Practicals (London and Dublin).

June 8th.—R.C.V.S. D.V.S.M. Written Examination commences, at Edinburgh.

June 22nd.—R.C.V.S. Membership Written Examination.

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"Doping" in Greyhounds

The Technical Development Committee of the N.V.M.A. has under consideration an article on malpractices and methods of "doping" in greyhounds. Any veterinary surgeon who can contribute to the information required is asked to write to the General Secretary, N.V.M.A., 36, Gordon Square, W.C.1, giving full details. In particular, the following information is desired:—

1. What methods are used which affect running, including drugs used and their effect?

2. Where drugs are used, is there any information available regarding the average amount of time lost over a given distance with particular reference to (*a*) the effect of varying dosage and

(*b*) administration at varying periods prior to racing ?

3. What are the clinical symptoms manifested, if any, when drugs are used, and what is the routine adopted to permit clinical detection or suspicion of "doping" ?

4. Give information on methods of administration of drugs used.

5. What specimens are forwarded to the laboratory for analysis to confirm or refute a suspicion of "doping," including method and time of collection ?

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Royal College of Veterinary Surgeons

JOHN HENRY STEEL MEMORIAL MEDAL

Award to Professor Dalling

The veterinary profession will welcome the news that the Council of the Royal College of Veterinary Surgeons unanimously adopted the report of the Selection Committee that the John Henry Steel Memorial Medal be awarded to Professor T. Dalling, M.A., M.R.C.V.S., F.R.S.E., President of the Royal College of Veterinary Surgeons and Chief Veterinary Officer of the Ministry of Agriculture and Fisheries.

This medal was founded in 1892 in memory of John Henry Steel (1855-91), B.SC., F.R.C.V.S., Army Veterinary Department, Principal of the Bombay Veterinary College, "to perpetuate the memory of an earnest worker, so that his example may incite others, and to benefit the profession by encouraging and rewarding merit."

Under this Trust the Council of the Royal College of Veterinary Surgeons has the power to award a medal.

The medal is voted by the Council as a reward for scientific or literary work of merit connected with the profession. Fellows and Members of the Royal College of Veterinary Surgeons are alone eligible for the award.

Previous holders have been:—

1897	Sir John M'Fadyean, M.B., B.SC., LL.D.
,,	Major-Gen. Sir F. Smith, K.C.M.G., C.B.
1898	G. Fleming, C.B., LL.D.
,,	Principal W. Williams.
1899	Principal James McCall.
,,	Sir F. T. G. Hobday, C.M.G., F.R.S.E.
1900	Principal J. R. U. Dewar
,,	Principal A. E. Mettam, B.SC.
1901	William Hunting.
1905	Sir Stewart Stockman.
1908	Professor O. Charnock Bradley, M.D., D.SC.
1912	Lt.-Col. J. D. Holmes, C.I.E., M.A., D.SC.
1915	Professor James Macqueen.
1918	Dr. Griffith Evans, D.SC., M.D.
1921	Albert Hassall.
1924	A. Leslie Sheather, D.SC.
1925	Professor Sydney Herbert Gaiger.
1928	Professor J. Share Jones, D.V.SC., M.SC., M.D. (V.h.c.).
,,	Professor G. H. Wooldridge, M.R.I.A.
1931	Professor J. F. Craig, M.A.
1934	Professor J. B. Buxton, M.A., D.V.H.
1937	William Woods, M.SC.
1941	George William Dunkin, D.V.H.

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Aleen Cust Research Scholarship

The Aleen Cust Research Scholarship has been awarded to Mr. David Elder Donald, B.SC., M.R.C.V.S., for work at the Mayo Foundation in the United States of America.

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Professorship of Veterinary Clinical Studies at Cambridge

In the *Cambridge University Reporter* of April 26th there is a notice to the effect that the Professorship of Veterinary Clinical Studies is vacant and steps will shortly be taken to fill it. Particulars may be obtained from the First Assistant Registrary, Old Schools, Cambridge.

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PERSONAL

Births.—JORDAN.—On April 23rd, 1950, to Isabella, wife of Frank T. W. Jordan, a son.

MOODY.—On April 16th, 1950, to Honor (*née* Barnacle), wife of Frank C. Moody, M.R.C.V.S., of Redditch, Worcs., a son—John Richard.

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Marriage.—DAWSON—GOLD.—On Wednesday, April 26th, 1950, at Feckenham Parish Church, by the Rev. A. E. L. Walker, the marriage was solemnised between Clifford Dawson, M.R.C.V.S., elder son of Mr. L. G. Dawson, of Bombey, Lincolnshire, and Patricia Norma, elder daughter of T. Norman Gold, M.R.C.V.S., and Mrs. Gold, of Redditch, Worcs.

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University of London B.Sc. (Vet. Science) Examination.—The pass list of the examination (March, 1950) contains the name of John Graham Bainbridge, of the Royal Veterinary College.

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Will.—Mr. William Allan, veterinary surgeon, of Broad Street, Wokingham, Berkshire, formerly practising at York, who died on November 17th last, aged 90, left £4,154.

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R.C.V.S. OBITUARY

Dr. Stanley Howarth Whitworth

Dr. S. H. Whitworth, whose death was recorded with deep regret in our issue of last week, was born on September 2nd, 1898, at Korumburra, Victoria, Australia, where he received his early education before attending the Agricultural College at Mongatha, Victoria. From there he entered the University of Melbourne where he took the degree of Bachelor of Veterinary Science. For a short period he was a Veterinary Officer in the Department of Agriculture before joining the Australian Army Veterinary Corps. Prior to his demobilisation he attended the Royal Veterinary College, London, and graduated a Member of the Royal College of Veterinary Surgeons.

In 1920 he entered the Colonial Service as a Veterinary Officer, Kenya Colony. Later at the Veterinary Research Institute, Kabete, Kenya and during a period of leave he worked in the University of Zurich and graduated Doctor of Veterinary Medicine. On promotion he was transferred as Veterinary Pathologist to the Gold Coast Colony where he investigated the production of rinderpest serum. Circumstances permitted him to return to England for a period, during which he worked on poultry diseases at the Veterinary Laboratory, Ministry of Agriculture, Weybridge.

In 1933 Dr. Whitworth was appointed Director of Veterinary Research and Veterinary Adviser, Federated States of Malaya. Whilst there he made an important contribution to our knowledge of rinderpest when he studied the introduction of the disease into Malaya by goats from India and in a paper published with Rocker in 1936 he drew attention to the role of the goat in the spread of infection.

Like other serving civilians in Malaya at the time of the fall of Singapore, he was taken prisoner and suffered severe privations in the Japanese Prisoner of War Camp in Singapore. When hostilities ceased he returned to England, his health seriously impaired, while his wife and daughter had died. He fought bravely to face this tragic loss and regain health. To a man of his activity of mind, work was essential and he was appointed to represent Canadian veterinary interests at Canada House in London. During the last six months he had been in failing health and died in a Nursing Home on April 21st.

Dr. Whitworth was a keen sportsman with an extensive knowledge of horses and farm livestock. All who had the privilege of knowing him appreciated his good fellowship and kindly nature, his sound common sense and ever willing offer of help to all, particularly to those in a less fortunate position ; but above all they admired his courage and the wonderfully good face that he was able to maintain during a long period of very great misfortune.

A son of Australia, he died in England, which he loved, and never ceased to praise the beauty of its countryside.

THE FUNERAL

The funeral took place at Horley, Surrey, on April 26th. A service, conducted by the Reverend W. Davis, Methodist minister, was held at the home of his brother, H. D. Whitworth, Esq., Bournhurst, Bonehurst Road, Horley, prior to the interment at Horley Cemetery.

The chief mourners were Mr. and Mrs. H. D. Whitworth, Miss Whitworth, (niece) and Messrs. Whitworth (three nephews).

The Canadian Government was represented by Colonel Robertson, accompanied by Mrs. Robertson, and Mr. Williams.

Dr. J. T. Edwards represented the Royal College of Veterinary Surgeons, Mr. W. A. Pool the Royal Society of Medicine and Central Veterinary Society, and Mr. N. Dobson, the National Veterinary Medical Association, with old colleagues of Dr. Whitworth, Veterinary Laboratory, Ministry of Agriculture, Weybridge. Mr. R. S. T. Bowden, who unfortunately was unable to be present, was represented by his parents Mr. and Mrs. A. Bowden, on behalf of the Malayan Veterinary Service. Mr. R. S. T. Bowden was a close friend of Dr. Whitworth and had served with him in Malaya in peace time and during internment by the Japanese.

The Late Mr. Arthur Gofton

A Further Tribute

Though late in the day, memory keeps recalling one whom many of his students will always remember as Professor Gofton. I was in his class when he was appointed Veterinary Inspector for Edinburgh and I well recall the day when he entered the class room after his appointment: he waited till the cheer was over and said, "Well, are you glad to be rid of me?" When he took good-bye of staff and students, Dr. Bradley in his remarks said of him, "He not only kept those below him in their place, but also those above him." The Principal seemed to feel losing this efficient courteous colleague.

Always well prepared, he gave us of his book learning, but how much more impressive were his notes from his own experience. A sound critic, indeed something of an iconoclast—much needed in his "Dick" days—when mistaken notions were rife. Not given to delivering homilies, though he once remarked, "It's by your mistakes that you'll learn."

I never knew a student (or any other body) trifle with him in any way. Smart in his work, confident and capable, modest but always with a quiet forcefulness that impressed students and all about him. That some myths grew around him was only natural, but never any to detract from him as one of the best of men.

Now they have all passed on! Dr. Bradley, Gofton, Matheson, Stewart M'Dougall, all in Clyde Street at the same time. Men like these made a college education worth while.

W. H.

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GENERAL OBITUARY

Percy Septimus Sibley

Many old graduates of the London College will learn with regret of the death of P. S. Sibley who for many years was the gateman at the Camden School. He passed away suddenly at his home at 67a, Howberry Road, Cannons Park, Edgware, on Sunday, April 23rd.

Sibley came to the College when he retired from the Metropolitan Police Force in 1927. He soon settled down to his new job and became somewhat of an "oracle" to whom one could go for information and advice on almost any topic.

Courteous and kind, he attended to the continuous stream of visitors, subscribers (irate and otherwise), students and telephone calls with the diplomacy of an ambassador. When he came to the College there was only one telephone instrument and his was the duty of searching out the member of the staff who was required and persuading him to come to the gate and take the call. He was a good trainer of boys and a number of his proteges now occupy responsible positions in commerce and on the staff of the College. He had a great sense of humour and never let his harassing duties get him down. He was an accomplished "detective" and one or two renowned Ms.R.C.V.S. will remember with a smile how he recovered the Professor's bottle of whisky and the bad taste it left in their mouths at the time. Others will remember his reaction when he was requested, in an agitated tone by a Professor and his assistant, to stop a large elephant from escaping through the College gate.

Sibley left the service of the College when certain old servants were discharged at the time of evacuation early in the recent war. It is good to know that his was no long illness; in fact he was out shopping on his bicycle only two days before his death. He was taken ill whilst watching a "big fight" on his television set. He was 68 years of age.

Professor McCunn represented the staff and his many friends in the profession at Golders Green on Wednesday, April 26th.

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NATIONAL SERVICE ACTS

Veterinary Students Completing Full-time Studies in 1950

We reproduce below the text of a memorandum, issued by the Ministry of Labour and National Service, in which are detailed the arrangements for dealing with veterinary students liable for National Service who will complete their studies in 1950. We deem it to be desirable that members of the profession should be acquainted with this information, because not only students but also potential employers should be fully aware of the position.

In the course of a covering letter addressed to the authorities of the Veterinary Schools, the Ministry states: "You will see that all men qualifying in the summer will be free to enter civilian agricultural practice subject to the prescribed conditions. These men will not be interviewed individually as in 1949, but they will shortly be asked by the Secretary of the University Joint Recruiting Board to furnish certain particulars for the information of the Technical and Scientific Register. . . . Men qualifying later in the year will be asked to complete the form at the same time, but whether they will all be free to enter civilian practice will depend upon the requirements of the R.A.V.C., and a further communication will be addressed to you on this matter later in the year."

Following is the text of the memorandum:—

(1) Veterinary students qualifying in 1950, like all other students deferred for the completion of full-time courses of study, become available for call up. The Army will, however, need only a very small number of men for service in their professional capacity in the R.A.V.C. in 1950. In these circumstances, and in view of the continued needs of agriculture, it is proposed in the first instance to rely on volunteers to meet the needs of the R.A.V.C. and to grant deferment to those men who enter agricultural practice.

(2) Men expecting to qualify either in the summer or at the end of the year who wish to volunteer for commissioned service in the R.A.V.C. should, as soon as possible, notify the Technical and Scientific Register at the address shown below, or should apply direct to the Director, Army Veterinary and Remount Services, War Office, Worcester Road, Droitwich. Men who are accepted for commissions will be called up under the National Service Acts and will not be required to serve beyond the normal period for which the national service man is called up, unless they volunteer and are accepted for short service commissions.

(3) Men qualifying in the summer will be free to enter civilian practice, and will be eligible for deferment subject to the following conditions:—

(i) The employment must be:—

(*a*) with private veterinary surgeons in practice of a predominantly agricultural character, including appointments as veterinary officers under the Ministry of Agriculture and Fisheries; or

(*b*) in veterinary practices concerned with the care of horses used in coal mines; or

(*c*) in a limited number of posts of high priority in Government service, including the Colonial Service, where the Department concerned obtains prior permission from the Ministry of Labour and National Service where ex-Servicemen are not available and where the appointment is of a grade equivalent to a scientific officer in the Scientific Civil Service.

(ii) The employment must be taken up within two months of the date of the announcement of the man's final examination results and in the case of the employments specified in (i) (*a*) and (*b*) above he must obtain the prior approval of the Technical and Scientific Register.

(iii) A man who is deferred under these arrangements will remain liable for call up for national service until he has reached the age of 26 years. Should he cease to be employed in an approved employment before he reaches the age of 26 he would be required to perform his national service if medically fit.

(4) Men qualifying at the end of the year may also be free to enter agricultural practice under the above conditions but a further statement regarding their position will be issued later in the year.

(5) The above arrangements apply to men entering employment. All graduates are eligible to apply for extension of deferment to undertake full-time university courses of further study or post-graduate research. Such applications, which must be supported by a recommendation from a university tutor, should be made in writing to the University Joint Recruiting Board, giving full details of the proposed course, dates of commencement and completion and the qualification in view.

Technical and Scientific Register,
York House,
Kingsway,
London, W.C.2.

April, 1950.

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Joint Committee of the British Medical Association and the National Veterinary Medical Association

The annual report of the Council of the British Medical Association, 1949-50, contains the following references to the work of the above Joint Committee:—

The Council appointed, with the N.V.M.A., a Joint Committee to formulate representations for transmission to Government departments on the provision of safe milk for the community and the supervision of production and distribution of other foods of animal origin. One of the first tasks of the Joint Committee was to prepare a memorandum on the provision of safe milk of high quality.

The Joint Committee's report dealt with milk production and distribution, major diseases in dairy cattle, and the administration

of the laws relating to the production and distribution of milk. It embodied the following recommendations:—

(1) The "Attested Herds Scheme" should be extended as rapidly as possible. Arrangements should be made for the tuberculin test to be more widely applied as a survey measure to accelerate progress in this direction.

(2) Although general slaughter of reactors is not a practical proposition at present, plans for their ultimate eradication should be considered.

(3) The question of branding reactors and of their segregation should be further explored and immediate steps should be taken to ensure that all milk from reactors is heat treated prior to consumption.

(4) All milk should be from tubercle-free cows and should be pasteurised. In the meantime, the number of designated milks should be reduced to two: (*a*) Tuberculin Tested, (*b*) Pasteurised.

(5) The Minister of Health should exercise a co-ordinating responsibility for the safety of milk at all stages of production and distribution, with particular reference to sampling.

The Council considers that the report of the Joint Committee was a contribution of some importance to a problem which has been the subject of many resolutions by the Representative Body.

The Report on the Provision of Safe Milk of High Quality drawn up by the Joint Committee has been distributed to medical officers of health and honorary secretaries of Branches and Divisions in England and Wales. The Council is anxious that medical representation should be secured on the County Milk and Dairies Advisory Committees, and local units of the Association have been requested to take steps to secure such representation.

The Council has also received and approved a report of the Joint Committee for submission to the Interdepartmental Committee on Meat Inspection. This report expressed the opinion that it was desirable that all animals should be inspected before slaughter; and that facilities for bacteriological examinations, and such other laboratory examinations as might be considered necessary, should be available for all slaughterhouses. The Joint Committee recommended that the chief meat inspector of each slaughtering centre should be a veterinary surgeon, who should be an officer of the local authority concerned, and that he should be assisted by detention officers who should be certificated lay inspectors or sanitary inspectors.

* * * * *

LEGAL NOTES

Unqualified Practice

First Conviction Under Veterinary Surgeons Act, 1948

On April 6th, 1950, Mr. George Carpenter, aged 65, of 25, Wellington Road, Dudley, was convicted by the County Borough of Dudley Justices of having practised veterinary surgery when his name was not on the Register of Veterinary Surgeons, or on the Supplementary Veterinary Register.

The defendant, who pleaded "guilty," was not represented and was fined £1 and ordered to pay £2 2s. costs, the magistrates having taken into consideration the fact that he was an old age pensioner and that he had claimed that he did not know the provisions of the Act and had been persuaded against his better judgment by the owner of the animal concerned to treat the animal.

The facts of the case were that on Sunday, October 30th, 1949, a horse was injured in a road accident, receiving a large wound in the stomach. The owner requested Mr. Carpenter to treat the horse, which he did, sewing up the wound and making a charge therefor.

Evidence was given by Mr. Howard Dawes, a veterinary surgeon, that the stitching of the wound had been done competently, Mr. Dawes having examined the animal on behalf of the police.

* * * * *

Restoration to R.C.V.S. Register

We are informed by Mr. W. G. R. Oates, as Registrar under the Veterinary Surgeons Acts, 1881 to 1948, that the name of James Cox Brown, 104, Harehills Avenue, Leeds, 8, was restored to the Register of Veterinary Surgeons on April 21st, 1950.

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

SWINE FEVER:

Southants.—Fox Farm, Amport, Andover, Hants (April 26th).

SHEEP SCAB:

Cumberland.—Town End Farm, Watermillock, Penrith, Cumberland. (April 3rd.)

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the N.V.M.A.

PANTING IN CATTLE

Sir,—As the R.A.V.C. officer who, in 1942, first drew the attention of the Veterinary Directorate, Army Headquarters, India, to the existence of a condition affecting hundreds of cattle in the Military Dairy Farms in that country and to which the name "panting" was then affixed, I think I may perhaps be permitted to comment on the abstract of Dr. F. C. Minett's article on "Panting in Cattle" which appeared in your issue of April 15th, 1950.

I had already read, in another journal, an earlier article by him on this subject in which he conveyed the impression that his experience of it was gained from observation of a small number of cases, and I remember arranging with the D.V.S. in India for despatch of a few affected cattle to the Government Research Institute, Bareilly, United Provinces, as it was thought they would be of interest to the workers there. In his preliminary investigation the writer had seen hundreds of affected animals and at his request for a full enquiry a detailed questionnaire was sent out by Army Headquarters and the replies to this embraced every Military Farm in India.

When writing this first article Mr. Minett did not appear to be aware that "panting," though not under this name, was well-known in tropical and sub-tropical countries all over the world. Professor Rhoad of the Staff of the Jenerette Agricultural Institute, Louisiana, U.S.A., has particularly distinguished himself by the amount of valuable work he has published on it as it affected animals in States bordering the Gulf of Texas. A booklet of great interest has also been published by a member of the Australian Veterinary Service—whose name I cannot at this period recall—as it affected animals in New South Wales and Queensland, particularly those in the North Western Coastal Districts. The condition has, in fact, been known for so long around the Gulf of Texas that, after the necessary development period the famous King Ranch in Texas State has succeeded in developing a breed of beef cattle, with three-eighths Indian (Brahma) and five-eighths Shorthorn blood, which takes its name "Santa Gertrudis" from the section of this million acre estate on which the breeding operations were carried out and which is free from "panting." It has long since been decided in the U.S.A. that this condition was due solely to the inability of cattle bred in temperate zones to stand up to the temperatures and humidity met with in sub-tropical areas of that country and that the breakdown which occurred was a permanent one, though subject to alleviation under varying conditions.

It is surprising that Dr. Minett has found cattle of pure Indian breed affected as opinion was unanimous among Managers of Military Dairy Farms in India, particularly at the Ferozepore Farm where a herd of heavy milking cattle of pure Sahiwal (Indian) breed has been maintained for years, that no such case had been seen while, in an investigation including almost every such farm in India, the writer had not seen or heard of an authentic case, whether cow or buffalo, in an indigenous animal.

Dr. Minett may not have had the advantage of access to the large number of animals in Military Dairy Farms, in which the exact breeding of all upgraded cattle was known up to 63/64th Friesian blood, after which an animal was regarded as pure bred. Investigation among such animals showed that, while the first cross was usually a fine physical specimen and a very fair milker in which the percentage of "panting" animals was low, with every succeeding upward cross the proportion affected rose rapidly until at seven-eighths European blood or more practically all cattle exposed to adverse heat conditions were affected. There was a gradual loss of stamina and, speaking from memory, I think it is correct to say that with each higher grade there was an overall loss of 1¼ lb. of milk while the average weight of calves also declined progressively. There was little if any cross-breeding in India outside Military Dairy Farms where it was common knowledge that the ravages of foot-and-mouth disease were, quite naturally, much more severe in cross-bred than in indigenous cattle which had a high degree of immunity. But while the heat control mechanism of animals so bred might break down under the strain of high body temperature accompanying this disease, endured in a climate of up to 125 degrees in the shade, it is quite incorrect to suggest that this disease is the originating cause of any high percentage of cases. He has, in fact, indicated the cause when he confirms the general conclusion arrived at in Military circles that the high yielding cows in any particular breeding category are most often severely affected, presumably because of the necessity to dispose of additional body heat arising from the utilisation of the large amounts of concentrated foods necessary to produce such yields. On the other hand, when such animals

are dry and on a subsistence ration, being relieved of the production of this extra body heat, they are less severely affected until they again come in milk when the severe symptoms inevitably occur.

Unquestionably the real cause is that already reached by Rhoad and his co-workers, *viz.*: that the heat controlling mechanism of animals containing high proportions of the blood of cattle bred for centuries in a temperate climate is unable to dispose of body heat in a temperature, often humid, which far exceeds that of their own bodies and that factors such as high lactation, fever, are most potent exciting causes of the breakdown which takes place. It is indeed interesting to reflect that, whereas the King Ranch used bulls with Indian blood to give their stock the desired protection, the Military Farms Department in India, in a well meant and largely successful effort to increase yields, unfortunately encountered this limiting factor through dilution, by means of imported European animals, of the indigenous blood of the country.

It would be interesting to know if any consideration has been given to the use of Indian or African bulls by those responsible for the cattle breeding scheme recently initiated by the British Government in Queensland, Australia. It is on record at the King Ranch that, at three years old, the first crossbred steers reared there averaged 300 lb. heavier than those of pure breed previously produced. From what the writer has seen and read of beef cattle in Australia it would appear that some such infusion of blood might be of the greatest possible value there.

Yours faithfully,

Dowdstown House, C. M. Stewart.
Maynooth,
Co. Kildare,
Ireland.

April 24th, 1950.

* * * * *

CHRONIC BRUCELLOSIS AND ALLERGY

Sir,—I have recently received a reprint of a paper by Joseph Francis Griggs, M.D., Claremont, California, entitled Bacterial Allergy, an Extreme Hypersensitisation Commonly Found in Chronic Brucellosis (*Annals of Allergy*. (1949.) **7**, 350-358). This paper should be of considerable interest to all veterinarians who have been or will be exposed to brucella infection.

The author states that many patients with chronic brucellosis have symptoms characteristic of an allergy, *e.g.*, "nasal catarrh, allergic 'sinusitis,' frequent sore throat, persistent cough, migrainoid headache, easy fatigability, skin eruptions, and myriad gastro-intestinal disorders." Very frequently these patients are hypersensitive to extremely minute amounts of brucella protein—even doses of molecular size. In his summary Griggs states: "There are strong suggestions that much of so-called chronic brucellosis is more accurately conceived as an intrinsic brucellar hypersensitiveness rather than as an active propagation or progressive invasion of living brucella organisms. Hyposensitisation brings about improvement in chronic brucellosis and in the symptoms of hypersensitiveness associated with this condition."

It has been my contention for some time that the minute amounts of brucella protein frequently present in milk and food products derived from milk will, when ingested by brucella-sensitive individuals, produce allergic symptoms characteristic of what is considered to be chronic brucellosis. It would seem that the eroded gums, spongy lips and frequent diarrhoea seen not uncommonly in chronic brucellosis could very well be caused by the reaction of the tissues to contact with brucella protein in food. I know a number of persons, myself included, who have had a history of brucella infection, and who have experienced some of the allergic symptoms listed by Dr. Griggs. The elimination of potential brucella-bearing foods from the diet appears to have markedly reduced the frequency and intensity of their and my symptoms. Although my contention is only conjecture, I believe it is worthy of consideration.

Yours faithfully,

733, Pammel Court, G. R. Carter.
Ames, Iowa.

April 20th, 1950

* * * * *

TREATMENT OF THE NERVOUS FORMS OF CANINE DISTEMPER

Sir,—I read with great interest the article by Professor Ullrich in your issue of April 22nd, on his experiences in the treatment of the nervous forms of canine distemper.

He says, "The procedure often seen in which patients are still treated that have been fevered for weeks and are showing symptoms of rhythmic myoclonia, with or without a paresis or paralysis of their hind legs resulting in intense emaciation, must be adjudged unwarrantable in the interests of the owner and ought therefore to be dropped."

I should like to give some details of a labrador retriever, 22 months old, which had hard-pad, and when making good progress suffered a bad relapse. Against my advice the dog was taken for a long walk and next morning I received a telephone message that it was paralysed in the hind quarters.

On examination I found pedal reflex very slight, temperature 103·2°. I resorted to B. & W.'s anti hard-pad serum and protein hydrolysate. Two days later there was a profuse nasal discharge, which was treated with penicillin and sulphamezathine. Emaciation became very marked, especially about the head and the lower part of the body.

Despite various forms of treatment, including electrical stimulus, there was little improvement, and the appetite became very capricious.

To my mind there seemed some barrier between the protein intake and its assimilation, and I remembered reading an article on the use of vitamin B_{12}. I decided to give this vitamin, knowing that if it did not do all I hoped, at least it would improve the appetite.

I gave six intramuscular injections of "Cytamen" (Glaxo) at 48-hourly intervals and found the results almost spectacular. Within 24 hours the dog was on its feet, and the appetite was very good. In addition the mental outlook was vastly better. In three weeks it could jump on to a chair. The dog is still making good progress and the feet and nose are peeling normally.

In a second case, a cocker spaniel, which had paresis of the hind quarters from hard-pad, one injection was sufficient to put it on its feet.

I cannot make any claim that this evidence is conclusive, and my only object in writing is to find if any other of your readers has used this and with what result. I should be pleased to hear their views on the subject. In any case, I believe that there may be something of value in its use in any case of this nature.

Yours faithfully,

H. J. Escott,
49, Rowlands Avenue, *Veterinary Practitioner.*
Waterlooville, Hants.

April 22nd, 1950.

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ATTESTATION: IS IT A GOOD POLICY?

Sir,—The correspondence under this heading has been summarised by Mr. Pitcher in your issue of April 22nd. I have pointed out elsewhere that the veterinary profession has rendered an important contribution to animal and human welfare by eradicating a large number of zymotic diseases from Great Britain.[1] The eradication of tuberculosis which is now being prosecuted after an unfortunate latent period is another very important step in this work. It would, therefore, be regrettable if the present correspondence were allowed to close without someone making the positive assertion that attestation is a good policy and is probably the most important single task on which the veterinary profession is engaged.

The valuable article by Watts & Robertson[2] provides good evidence in support of this view, particularly when extended to the whole country. There are some 3,500,000 dairy cows in Great Britain, and nearly one quarter (say 800,000) are slaughtered every year and used for food. This represents nearly half of all cattle slaughtered for food. It is generally stated that 40 per cent. of old cows are tuberculous. The figure may now be lower, but if one takes 35 per cent. it will be seen that 280,000 are tuberculous. Of these, about 20 per cent. are totally condemned and 25 per cent. partially condemned. (These figures are based on the statistics of Watts & Robertson before 1936 but are confirmed by figures from Newcastle. They may, of course, be lower in some other areas). If one includes the value of the offal it is fair to assume that this 25 per cent. partial condemnation represents 12 per cent. of all tuberculous cow beef, or that 32 per cent. of all tuberculous cows slaughtered are of no value for food (many tuberculous cows only have lesions in their lungs, so no carcase meat is condemned). This represents about 90,000 cows. Each cow should yield 550 lb. of meat and therefore represents about ten annual meat rations. So that meat rations for nearly 1,000,000 people are being constantly lost. This calculation leaves out of account the fact that about 10 per cent. of bullocks and maiden heifers that are slaughtered are tuberculous, although they are less extensively affected than old cows. If one assumes that the milk yield of tuberculous cows is reduced by 10 per cent., some 3 per cent. of total milk production, or about 40,000,000 gallons, are lost annually.

It was stated in the House of Commons some time ago that the plans for the control of bovine tuberculosis would be postponed as an "economy measure." No announcement was made about postponing plans for extending pasteurisation, and although the statement was quickly withdrawn, it should be pointed out that, if we have to economise in the measures to produce a satisfactory

milk supply, it is far better to go slow with plans for pasteurising milk in rural areas than for eradicating tuberculosis.

At present tuberculous infection acquired from cattle is responsible for nearly 1,000 deaths a year. When once bovine tuberculosis has been eradicated the dangers of drinking raw milk, particularly in country districts, will be very slight. The eradication of bovine tuberculosis will greatly reduce the incidence of ill-health in our dairy herds, increase the milking life of cows, and thus permit better selection of heifers for milk production and improvement of the national herd. How much better, if we have to choose, to make a determined effort to eradicate tuberculosis quickly than to install expensive pasteurising plant all over the country, or, alternatively, to transport milk to central depots and then back again to the country. The policy of eradicating bovine tuberculosis will yield increasing financial advantages: pasteurising plant even when obtained will require maintenance and fuel.

The idea that "tuberculin" or other products in milk may confer immunity on human beings is pure supposition: experimental evidence is against it, and so many factors influence epidemiological trends that the figures quoted cannot be accepted as evidence. There can, of course, be no real doubt that virulent tubercle bacilli in milk do produce slight lesions in a large proportion of some populations and so protect against respiratory infection acquired during the dangerous adolescent period.[3] But tubercle bacilli in milk kill nearly 1,000 people a year, so they clearly cannot be tolerated as a means of immunisation. It is the responsibility of the medical authorities to take steps, by the application of B.C.G.[1] and other measures they may deem necessary, to maintain resistance against tuberculosis.

Tuberculosis is a subject in which there has always been ample room for argument, but one fact is beyond dispute: without the tubercle bacillus there is no tuberculosis. By illustrating this fact as efficiently as possible in the animal field we may hasten the day when the tubercle bacillus is removed from the environment of both animals and man.

Yours faithfully,
JOHN FRANCIS.

60, Woodford Road,
Bramhall,
Cheshire.

1 FRANCIS, J. (1949.) Tuberculosis: the control of an infectious disease. *Lancet*. ii. 549.
2 WATTS, P. S., & ROBERTSON, J. (1950.) The influence of the Attested Herd Scheme on the local incidence and degree of tuberculosis in slaughtered cows and calves. *Vet. Rec.* **62.** No. 10. 127.
3 FRANCIS, J. (1950.) Control of infection with the bovine tubercle bacillus. *Lancet*. i. 34.

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Sir,—Your correspondent, L. Pitcher, in his letter under the above heading in your issue of February 4th, cast a big stone into a wide pond: the ripples have reached these shores. Those who expected a speedy defeat of Mr. Pitcher's statistical argument must have been disappointed by the criticisms that appeared in the *Record* of February 18th received here a few days ago.

Although, as your correspondent, W. J. Daniel, rightly concluded, we should "fit our theories to facts and not the facts to theories," it seemed to us that it was L. Pitcher, rather than his critics, who gave us facts. The suggestion by W. J. Daniel, for instance, that the bulking of 80 per cent. of T.T. milk along with 20 per cent. or thereabouts of ordinary milk would be fatal to Pitcher's case was fanciful rather than factual. The obvious corollary would be that, by reason of such dilution, the attestation policy in Scotland has had nothing to do with the reduction of non-respiratory tuberculosis in human vital statistics. It is not likely that Mr. Pitcher's critics would go as far as that.

Also fanciful rather than factual is the suggestion by Richard W. Hillman and K. G. Luckin that "changing industrial conditions in Scotland" and the slums of Glasgow can account for the grim contrast between the vital statistics of human tuberculosis north and south of the Tweed. One is tempted to observe that here is a naive instance of assessing vital statistics in a vacuum, and to ask why Scotland alone should be identified with "changing industrial conditions" in the modern world. Or why it should be assumed that only in Scotland are tuberculous patients allowed to be at large. But it is on facts alone that Mr. Pitcher's indictment must be judged, and it would have been so easy for Mr. Pitcher's critics in Britain, with ready means of access to the latest relevant vital statistics, to give us the figures for Glasgow as compared with the rest of Scotland, and with industrial cities in England. By omitting to take this simple and obvious course the critics lost the best possible chance of fitting facts to their own theories and confounding both the theories and the facts of L. Pitcher.

Like Mr. Pitcher, I regret that separate vital statistics of human tuberculosis for Wales cannot easily be obtained, because such statistics over a long period might throw more light on a perplexing question. If Caradoc Evans and other Welsh writers are correct, and if what one has always heard is true, respiratory tuberculosis of human beings has long been particularly prevalent in parts of Wales, as it formerly was in parts of Devonshire. And we know, of course, that the incidence of bovine tuberculosis has generally been less in Wales and South-West England than in the rest of Britain on the whole.

A fact that has been missed by both Mr. Pitcher and his critics is that the Scottish statistics of human mortality from tuberculosis have not apparently benefited by the elimination of the danger of infection by droplet or dust inhalation in cowsheds. If recent continental research on this question is to be believed, such a source of infection in pre-attestation days must have caused many human deaths which should appreciably affect the general statistics. Consequently the death rate in Scotland from respiratory tuberculosis is, say, 5 per cent. higher than it would presumably be if there had been no attestation, so that the unfavourable comparison to-day with England and Wales is really much worse than appears from the statistics.

The question is too important to be shirked and Mr. Pitcher, whether right or wrong, has done a public service in daring to offer an explanation. And *The Veterinary Record* deserves our praise and thanks for giving the matter the necessary publicity.

Yours faithfully,
J. W. RAINEY.

c/o Union Bank of Australia,
Hobart, Tasmania.
April 17th, 1950.

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ADVERTISERS' ANNOUNCEMENTS

Milward's announce three new features in 'Vim' syringes. The latest jointing cement withstands temperatures greatly in excess of 160° C.

The calibration markings are now an integral part of the glass through a new vitrifying process.

An improved grinding technique greatly increases the accuracy of fit between the barrel and plunger.

The sole agents are Chas. F. Thackray, Ltd., of Leeds.

* * * *

STREPTOMYCIN AND BOVINE MASTITIS

New Agent Effective Against Penicillin-Resistant Strains

Glaxo Laboratories, Ltd., Greenford, Middlesex, from whom full particulars may be obtained, announce the introduction of Dihydrostreptomycin Veterinary Cerate Glaxo, a valuable streptomycin treatment for some forms of bovine mastitis which are resistant to penicillin. This new treatment is being regarded as complementary to penicillin and not as a replacement.

Dihydrostreptomycin Veterinary Cerate Glaxo is supplied to veterinary practitioners against their signed prescriptions in boxes of 12 tubes. Each tube contains a single dose of dihydrostreptomycin sulphate equivalent to 0·25 gramme (250,000 units) streptomycin base. The tube is fitted with a nozzle for convenient insertion.

Special contract rates are available to veterinary surgeons; if required, combined contracts for penicillin and dihydrostreptomycin cerates can be arranged.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Fowl Pest	Parasitic Mange*	Sheep Scab	Swine Fever
April 1st to 15th, 1950	12	—	8	—	1	—
Corresponding period in—						
1949	7	2	17	—	—	—
1948	6	—	6	—	—	4
1947	4	—	34	—	1	—
Jan. 1st to April 15th, 1950	138	12	60	—	19	1
Corresponding period in—						
1949	48	11	140	—	26	4
1948	35	—	155	1	21	11
1947	20	83	61	1	15	14

NOTE.—The figures for the current year are approximate only
* Excluding outbreaks in Army Horses.

Tuberculosis Order of 1938

The number of bovine animals slaughtered under the Tuberculosis Order of 1938 during the period January 1st to March 31st, 1950, was 1,459.